the OIL AND GAS JOURNAL

OCTOBER 1, 1956

Can anyone win in California?

p. 60

How U. S. Could Make Up for the Loss of Suez. p. 52

Tomorrow's Tools - Today!

This is the debris not left to clog perforations by Power-Pak Karrotfree Koneshot.

POWER-PAK CHARGES

mean cleaner,

karrotfree koneshot

PERFORATIONS

Lane-Wells designed and perfected Karrotfree Koneshot Perforating to give the industry cleaner perforations without loss of penetration. Power-Pak Koneshot charge design gives you all the advantages of Karrotfree perforating plus, on actual test, deeper clean, debris-free perforations.

Power-Pak perforating, an original exclusive Lane-Wells development, is available only through Lane-Wells Branches. For consistently better perforating results, call Lane-Wells and "get the job done right."

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40-SHOT UNITS

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A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Isomerization, offered now in several licensed process forms, has not been picked up by any refiners or natural gasoline processors—yet.

It is generally assumed in the industry that refiners will first add all the catalytic reforming capacity they can use, and then use it at successively higher severity levels before adopting isomerization of the C_5-C_7 fractions of gasoline. Expensive, especially from the standpoint of the fractionation required for separating and recycling straightchain components, isomerization may see its first use when cat reforming has risen to a level where yields fall below the 80 per cent figure.

Road octanes are sticking closer to research ratings than many refiners would have believed. A recent survey shows ratings obtained in representative high-requirement cars average about one number below research ratings on premium grades and a little more than one number for regular. This is contrasted with the research-motor spread, called sensitivity, of 10 numbers for premium and about 6.5 for regular.

The first ammonia from heavy residual fuel oil is almost a reality. It will soon be flowing from the Searsport, Me., plant of Northern Chemical Industries. The Texaco synthesis-gas generator has passed muster with some successful runs, and now the company is checking out other units down the line. Full operation of the ammonia plant is expected early this month.

A refinery now on the drawing boards for this country is going to make a leaded 100-octane pool gasoline, according to its promoters.

The plan calls for making a single premium grade of this quality, using advanced cracking, reforming, and alkylation processes. The project does not include isomerization of pentanes, hexanes, or heptanes. By the time it is built, if it is built, the premium octane level may have risen so much higher that some additional processing may be required.

Refiners and the military seem to be as far as ever from realistic agreement on standardizing jet-fuel grades. Recent discussions underscore the gap. A refining representative called for world standardization on two grades—JP-4 and a kerosine type. But military spokesmen talked of seven or more grades and discussed the possibilities of wanting a doctor sweet JP-5.

High-viscosity water may become a new tool for increasing oil recovery in low-gravity fields. Laboratory work indicates that higher viscosity, achieved through additives, helps control the flood front, although it requires higher pressures. A field test in California, where the method would be of greatest benefit, may be the next step.

Motor-oil specifications, because of their relationship to carbon deposits, are becoming as important as fuel properties in solving knock problems. Many research men think increasing use of additives is in prospect. Some even predict that finished motor oils soon will contain more synthetics than direct petroleum derivatives.

The OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY–OPERATION

Pipelining

P. D. Meters Get The Job Done **87**

By Dee C. McKinley

Use of p.d. meters is a sound and reliable practice for crude-oil measurements, as far as Interstate Oil Pipe Line is concerned. Often they can be justified on increased accuracy of measurement alone. Reduced tankage, elimination of evaporation losses, and lower labor costs also result. Maintenance of the meters is not excessive.

Pipeline Patrol: Construction Tables **121**

Drilling-Production

Flexibility in Gas-Lifting Multiple Completions **78**

By William B. Adair

Most of the problems of gas-lifting production from multiple-zone wells can be solved by fluid-operated valves utilizing a common reservoir of supply gas. Such a system is capable of lifting required fluid volumes for most multiple-zone wells and yet maintains simplicity of control and flexibility of operation.

Mene Grande Rigs Drill 31½ Per Cent More Footage **95**

By W. M. Sanders, F. G. Van Matre, E. D. Arnold, and H. J. Huebner

Mene Grande rigs in eastern Venezuela are averaging 31½ per cent more footage during the last several months. This increase can be attributed to three important factors: (1) improved drilling mud, (2) increased weight on the bit, and (3) more and better supervision.

Field Processing—19: Back-Pressure Control **106**

By Dr. John M. Campbell

Pilot-operated diaphragm motor valves are usually used in the oil fields for back-pressure and pressure-reduction control where pressures are greater than 125 psig.

On The Job . . . In The Fields **108**

Tubing vacuum cleaner saves workover time; bit holder is easily made.

Refining-Processing

Platforming in a Natural Gasoline Plant **74**

By R. F. Cox and R. H. Killgore

Experience at the Dubach, La., plant of Southwest Gas Producing Co., Inc., and Feazel Interests proves the feasibility of Platforming in conjunction with natural gasoline-condensate recovery plants. It affords a way for the producer to remain in the competitive motor-fuel market with a practical capital outlay.

Electrical Power Systems for Refineries **82**

By George R. Dunbar

The major factors to consider when designing an electrical distribution system for a refinery are the type of system, the substation voltages and bussing arrangement, the type of grounding, and methods of relaying. These points are discussed here.

Cost-imating **110**

Refinery Construction Index **110**

On The Job . . . In The Plants **112**

Correct training methods conducted by National Petro-Chemicals Corp., Tuscola, Ill., for maximum safety protection have given this firm extremely good results.

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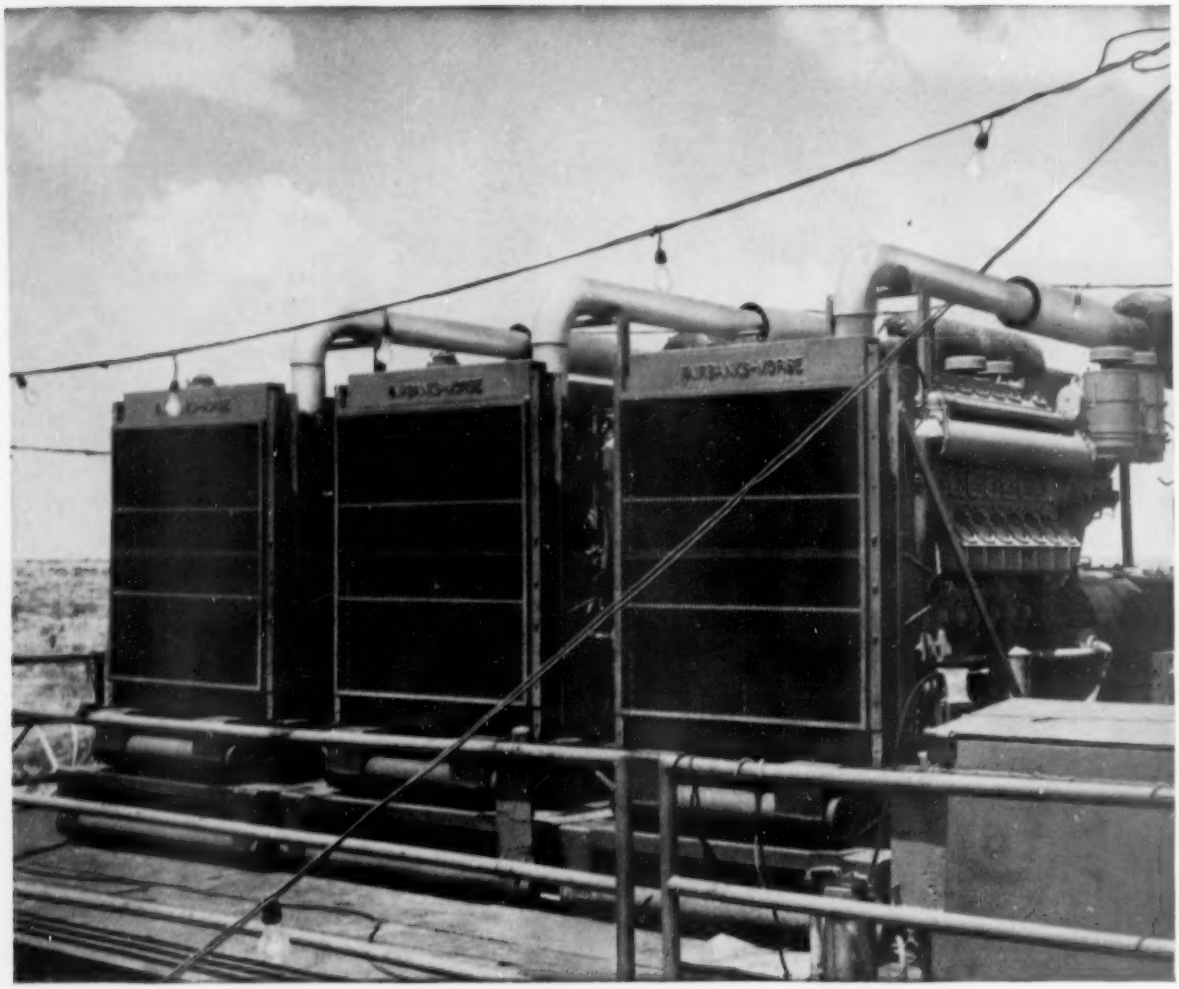

The 38-F-90 is a drilling engine

Here's Why

Fuel? . . . The 38-F-90 burns gas, propane or liquid fuel with the inherent economies of diesel compression.

Hp. rating? . . . Continuous slush pump rating is 75 hp. per cylinder, and the six sizes (4-5-6-7-8-10) include the right engine for any job between 300 and 750 hp. Whether four cylinders or ten, it's the same engine, the same width and height, the same operating technique. Many parts are interchangeable.

Speed range? . . . The 38-F-90 is rated for continuous heavy-duty service from 450 to 1200 RPM. This range is right for any mechanical, hydraulic or electric drive.

Give and take? . . . The 38-F-90 is a Fairbanks-Morse engine. This means that it will give service and take punishment. Its simplicity and its stamina are the result of its Opposed-Piston two-cycle design and its all-steel welded frame.

This all adds up to why the Fairbanks-Morse 38-F-90 is a *drilling* engine. Fairbanks, Morse & Co., Oil Field Division, Chicago 5, Illinois.

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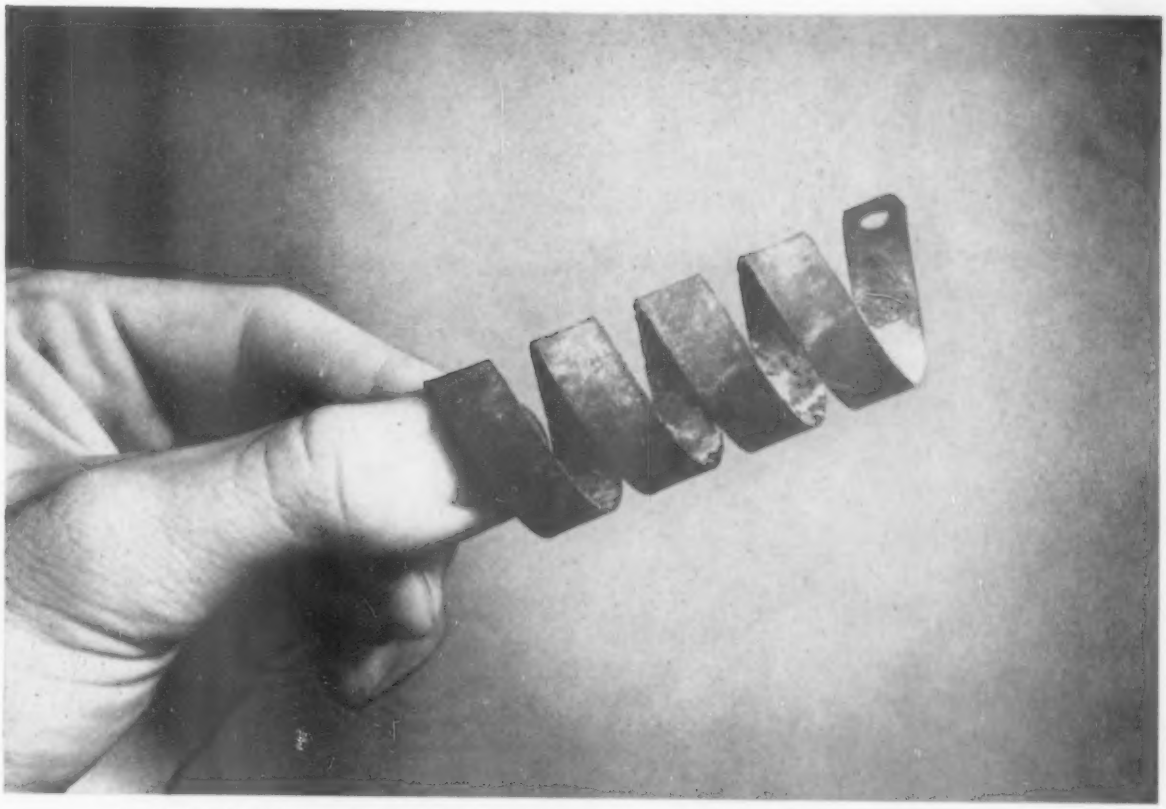

THIS STACK CONTROL element had to be removed from a domestic heating unit because of faulty operation caused by deposits. The non-metallic, ashless properties of Du Pont FOA-2 can help you reduce similar failures, and consequent service calls, to a minimum.

Many stack control failures can be prevented with this *ashless* additive

Du Pont Fuel Oil Additive No. 2 (FOA-2) can protect your distributors against many unprofitable service calls. Since it is a non-metallic, *ashless* additive, it burns completely, without leaving any significant trace of deposit to interfere with the operation of stack controls.

This ashless feature also means that heating oils stabilized with Du Pont FOA-2 will not contribute to deposits that cause shorting on the electrodes of the burner system. In this way, it helps to minimize ignition failures, too.

To prevent clogging of nozzles, screens and filters—another common cause of service calls costly to distributors—FOA-2 retards the formation of insoluble residues. And this stabilizing action is effective over unusually long storage periods.

FOA-2 also has an effective dispersant action which reduces the particle size of any residues that may form. And it helps to remove existing sludge deposits from the fuel system.

For best results, FOA-2 should be added to freshly prepared stocks at the refinery. It is economical to use because it is effective in low concentrations. Any of our sales offices listed below will be glad to supply you with the full details.

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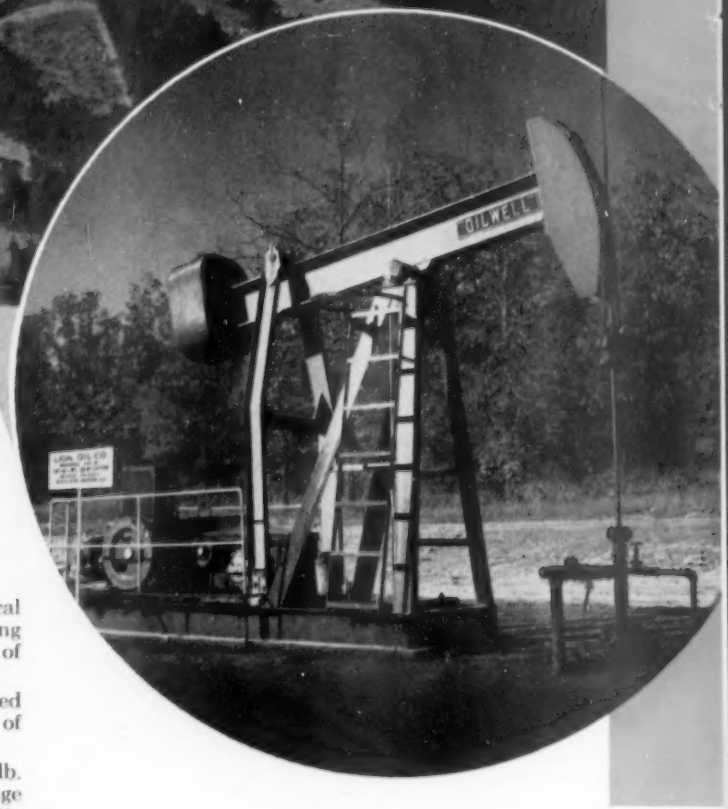
41 OUT OF THE LAST 41

...and there are good reasons why every one's an "OILWELL"



LION OIL COMPANY, a division of Monsanto Chemical Company, recently installed 41 "Oilwell" Pumping Units in its Cottage Grove field, 25 miles northeast of Shreveport, Louisiana.

Six of the first-equipped wells in this field are pumped by 12-G-12 units, having polished rod load capacities of 10,600 or 11,300 lbs.

The remaining 35 units are 9-A-9's with 9,000 lb. polished rod load capacity and a stroke length range from 24⅛" to 38". They are powered by "98RC" Witte engines and are currently operating at about 16 strokes per minute; handling production from approximately 2,000 feet with ⅝" rod strings and 1½" subsurface pumps. This size unit achieves accurate counterbalancing with slab-type counterweights on the extended walking beam and is extremely economical to buy, install, and operate.

Heavy structural-steel base, with wide-spaced, four-legged, derrick-type samson post, eliminates maintenance problems encountered in units of less rigid construction. The advantages of standardization are obvious. One man with a grease gun can grease-pack every pumping-unit-frame bearing (equalizer bearing, saddle and wrist-pin bearings) in a matter of minutes.

Let an "Oilwell" Representative . . . help you standardize on pumping units that will give you the most economical service throughout the producing life of your field.

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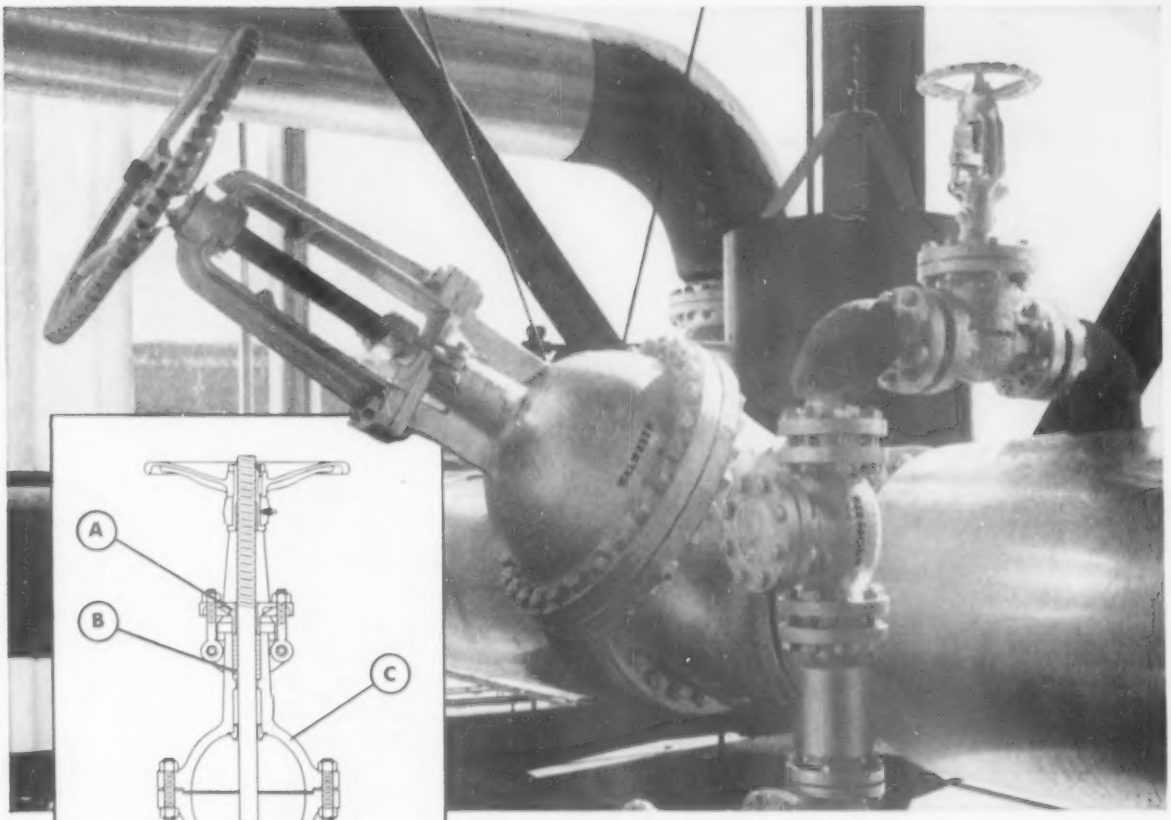
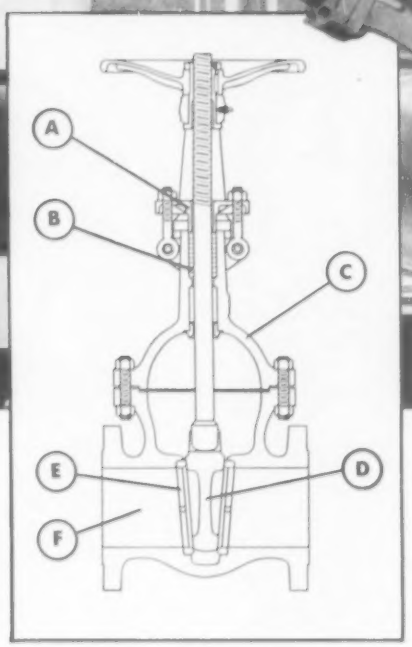
TRADE MARK

UNITED STATES STEEL





Walworth Series 150 and 300

CAST STEEL GATE VALVES OFFER YOU THESE FEATURES

for 'round-the-plant service

(A) GLANDS: Clearances between the gland and stuffing box, and gland and stem, are such that the stem cannot be scored even if the gland is pulled down unevenly.

(B) DEEP STUFFING BOXES: More than adequate in all sizes (2" to 24") to assure tightness and maximum packing life.

(C) BONNETS AND BODIES: Engineered to exceed the requirements of all applicable codes and standards. They are tough, durable, dependable.

(D) INTEGRAL GUIDE RIB FACES IN BODY: Machined to insure accurate centering of the gate.

(E) STURDY SEAT RINGS: Bottom-seated so that no recess exists at the back of the ring to cause turbulence, erosion and pressure drop.

(F) STREAMLINED PORTS: Permit unobstructed flow which results in minimum pressure drop and reduces the possibility of erosion.

Walworth Cast Steel Gate Valves can be furnished with either flanged ends or butt welding ends. Roller bearing yokes are available on the larger sizes. On valves 4 inches and larger, by-passes can be furnished. Walworth Cast Steel Gate, Globe and Check Valves from Series 150 to 2500, are available. For Series 600 and higher, we recommend Walworth Pressure Seal Cast Steel Valves. See your Walworth Distributor or write to Walworth for complete information.

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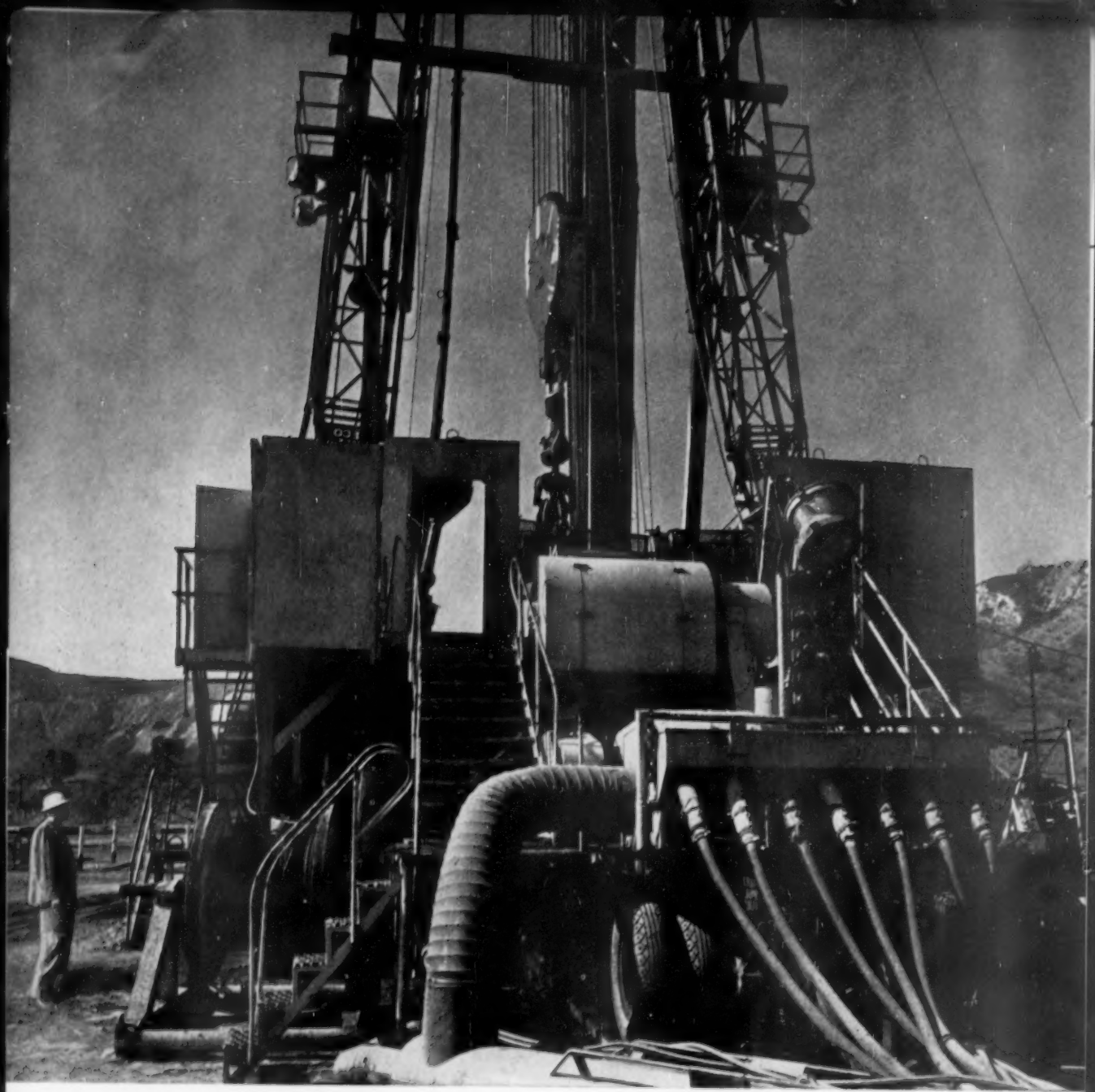


Wire Rope at Work—Of interest to drilling men is this all-electric rig owned and operated by the Shell Oil Company. When photographed, it was redrilling a 12,500-ft well that had ceased producing in profitable volume. The locale of the job was the rugged, hilly country northwest of Ventura, California.

The rig is controlled by a series of push-buttons arranged on an operating console. It uses the familiar jackknife type of mast, 136 ft high. For the job shown in the photograph above, the outfit was equipped with 2500 ft of Bethlehem wire rope, 1¼-in. diam, Purple Strand grade. A very sound choice, for Purple Strand has the high strength needed in deep drilling, as well as the toughness and dependability that mean a long and useful life.

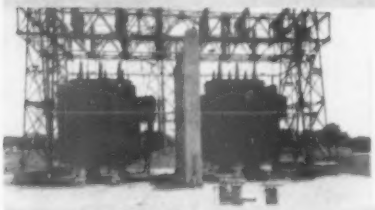
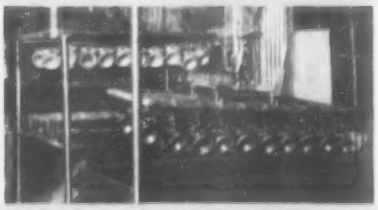
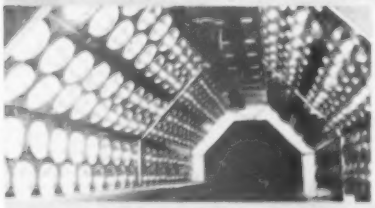
Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:
PETROLEUM • MINING • CONSTRUCTION • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

How many of these SPECIAL FIRE HAZARDS does your plant contain?

Practically every manufacturer has what we call "special fire hazards" — extra hazardous areas in his plant where special protection must be provided to insure against possibly serious loss by fire. Some of these hazards are illustrated below, along with the special fire protection systems recommended to arrest fire without delay. And there are many other hazards, too, where major or minor supplements to ordinary-hazard fire protection systems are a positive "must" — if trouble is to be safely avoided.

Grinnell, with 87 years experience protecting against fire hazards of every description, has a fire protection system for every need. Moreover, the installation of the proper Grinnell System usually serves to reduce fire insurance premiums drastically, often pays for itself in a few years. Check your own hazardous areas against the list that follows:

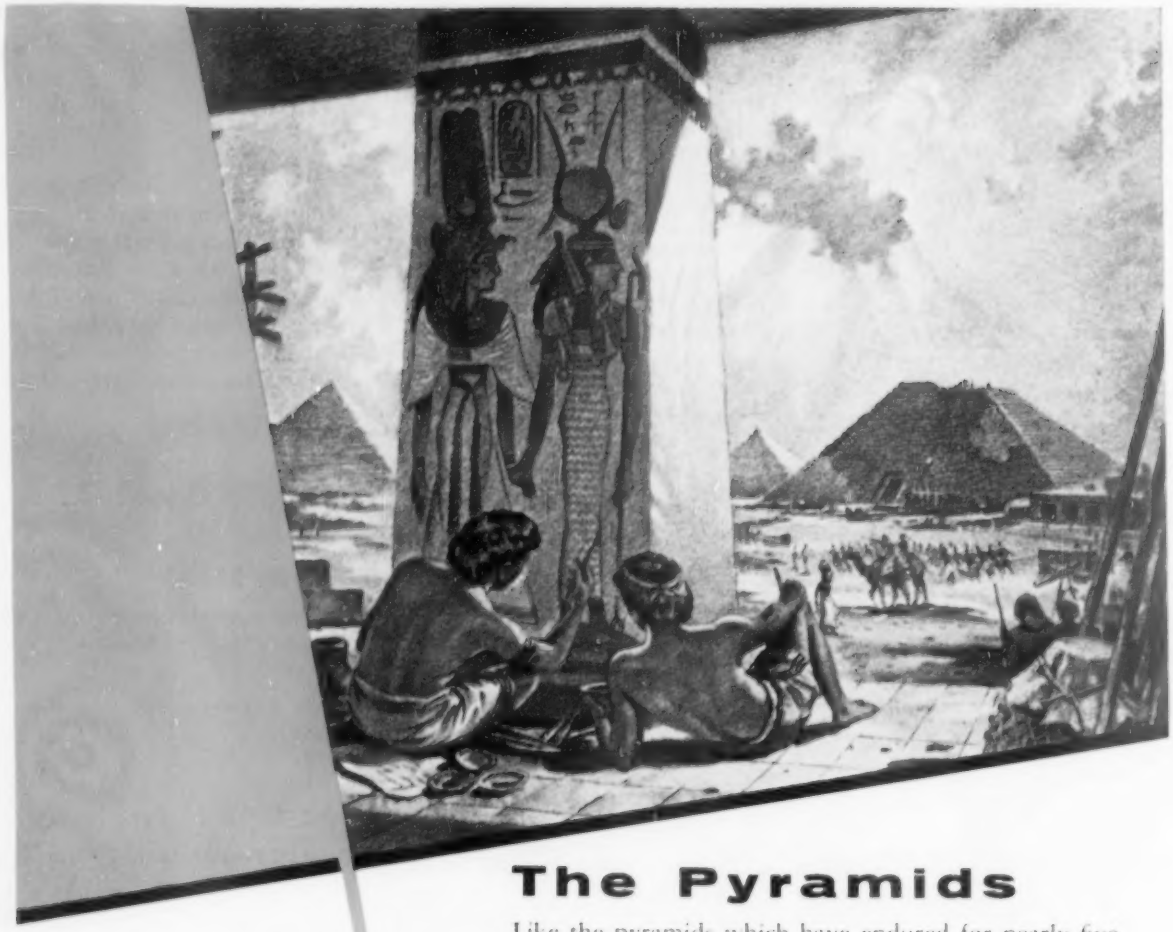
SPECIAL FIRE HAZARD		RECOMMENDED SYSTEM
 Transformers	Propane tanks	**WATER SPRAY** Grinnell ProtectoSpray; Grinnell Mulsifyre Systems
Bulk oil storage tanks	Flammable chemicals storage	**FOAM** Grinnell ProtectoFoam System
Engine test cells	 Dip tanks	**CARBON DIOXIDE** Grinnell CO_2 System
 Infrared driers	Flammable liquid pumping stations	**DRY CHEMICALS** Grinnell Dry Chemical System

Call in a Grinnell Fire Protection Engineer. With a full range of equipment, you are assured of unbiased recommendations which will be fitted to your requirements. Grinnell Company, Inc., 256 West Exchange St., Providence, R. I.

GRINNELL

WHENEVER FIRE PROTECTION IS INVOLVED

Manufacturing, Engineering, and Installation of Fire Protection Systems since 1870



The Pyramids

Like the pyramids which have endured for nearly five thousand years, the Texas Employers' Insurance Association was built with strength to withstand any stress or strain and safeguard the interests of its policyholders.

Forty-two years of successful operation, through wars and depressions, have tested and proved the *Strength* of the Association. Today the Association is the leader in its field, with assets of $22,808,501 and surplus to policyholders of $6,844,353.

Last year the Texas Employers' Insurance Association paid $10,690,456 in settlement of claims and returned $3,855,678 in DIVIDENDS and GUARANTEED COST DISCOUNTS to its policyholders. Are you, like others in the Oil and Gas Industry, taking advantage of the SECURITY, SERVICE and SAVINGS offered by . . .

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$46,000,000
Saved and Returned to
POLICYHOLDERS

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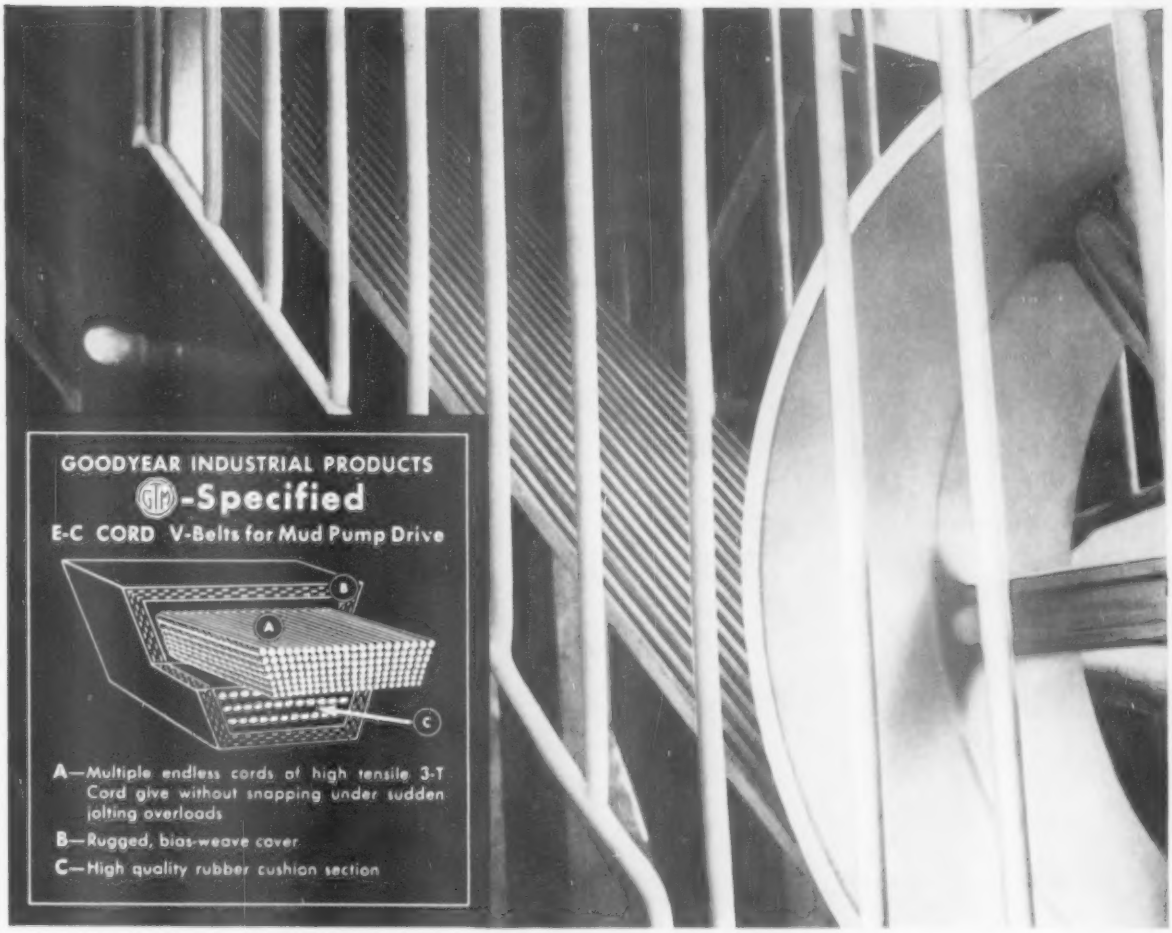
GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified
E-C CORD V-Belts for Mud Pump Drive
B
A
C
A—Multiple endless cords of high tensile 3-T Cord give without snapping under sudden jolting overloads
B—Rugged, bias-weave cover
C—High quality rubber cushion section

G.T. M. specifies mud pump belts that go 20 wells+

Mud pump trouble can spell costly trouble on any rig. That's why, for the drive pictured above, the drilling engineer relied on the G.T.M – Goodyear Technical Man – to specify the right belts.

The G.T.M. went over the drive in detail, then recommended a carefully matched set of 18 E-C Cord V-Belts (see blueprint) to do the job. A recent report revealed these husky belts had powered their way through *20 wells* for a total of over *135,000 feet of hole*–and still looked *"good as new."*

The G.T.M. can also give *you* a better answer to your V-belt or other industrial rubber problems. Why not contact him today? Call your Goodyear Distributor. Or write:

Goodyear, Industrial Products Division
Akron 16, Ohio

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E-C Cord–T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

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PUMPING UNITS

"Engineered"—not just "built"

Designed and engineered to stand up under hard usage with minimum upkeep.

One of few unit lines available with anti-friction bearings throughout.

Precision-cut gears (not lapped) permit partial replacement in the field when necessary. High hardness gear material stands up under hard wear.

Quick, safe adjustment of counterbalances at ground level by one man. Emsco counterbalances may be adjusted to lead or lag the load as required.

Complete accessories, ground-level lubrication, guards, skid extensions, slide rails and modern brake.

Extra rigid gear case allows precision gears to operate as designed.

No oil seals to wear out in reducer.

Four-legged Samson post is extremely rigid.

Two sumps for oil to drop out emulsions or particles.

There's an Emsco Pumping Unit for every type of well. Send for two colorful new bulletins or see your nearest Continental or D+B store for complete information.

CONTINENTAL

Serving the Oil and Gas Industries

CONTINENTAL SUPPLY COMPANY

A Division of The Youngstown Sheet and Tube Company

General Offices: Dallas, Texas

Representatives in all principal oil fields of the world

D+B

QUALITY IS OUR PRODUCT EMSCO

D+B DIVISION

EMSCO MANUFACTURING COMPANY

Garland, Tex. • LOS ANGELES, CALIF. • Houston, Tex.

General Sales Offices: Dallas, Texas

PT-606

Only ONE demulsifier works best for you...

Aquaness Field Service Men are thoroughly trained to help you with all your demulsification—and corrosion—problems.

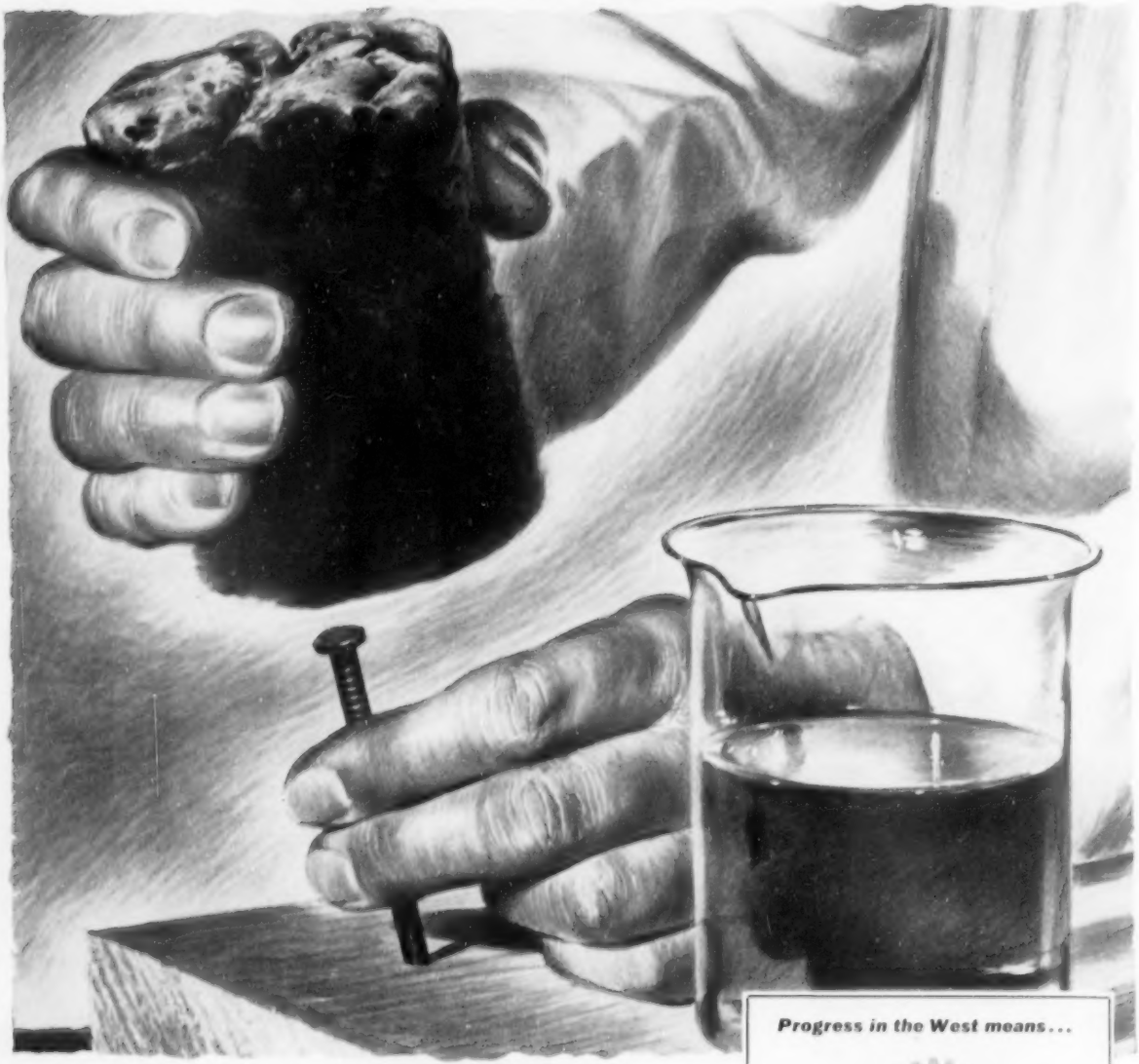
For example, although there are hundreds of demulsifiers that might work for you, only *one* does the most effective, most economical job. Finding the right demulsifier for you may mean running test after test, checking and rechecking. It takes hard work and long experience. And it is this combination of all-out effort and intimate first-hand knowledge that sets Aquaness service apart.

Aquaness chemicals for the petroleum industry are proving their merit every day . . . in performance, in uniformity. The thoroughness of Aquaness service puts these chemicals to work in the most profitable manner for you.

Our Field Service Men are strategically spotted in the major producing and refining areas. A phone call will bring one promptly to discuss your problem or provide complete information on any Aquaness product.

Aquaness
Department
ATLAS
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas

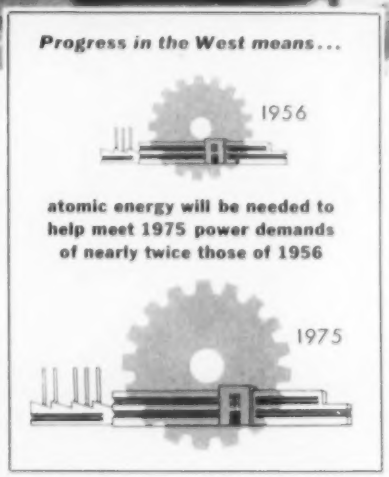
Standard's new radiation-resistant lubricants are helping put atomic power to work



During exposure to atomic radiation, some petroleum oils are turned into solids, hard enough to drive a nail, useless as a lubricant

BY 1975 the world will use nearly twice as much energy as it does today—and atomic power will be needed to supply part of the growing demand. Helping develop this new power, Standard research teams have been working with the Atomic Energy Commission on many projects during the past 10 years.

One of our most urgent problems was to find lubricants for atomic machinery able to withstand withering radiation. Using a brand-new base derived from petroleum, Standard scientists developed oils that last two to three times longer than conventional lubricants—and speed the day when commercial atomic power will help drive planes and ships, and generate electricity for your home.


Progress in the West means...
1956
atomic energy will be needed to help meet 1975 power demands of nearly twice those of 1956
1975

STANDARD OIL COMPANY OF CALIFORNIA

puts petroleum progress to work for you

Pump keeps working, oil keeps coming with TIMKEN® bearings on the crankshaft

THIS Worthington VTE-2 Plunger Pump has to inject water under pressure into oil-bearing sands to revitalize the well and keep oil coming. It's a 24-hour-a-day job, day-in, day-out. The pump mustn't stop for any reason. To keep it on the go with unattended operation, Worthington engineers mounted the crankshaft on Timken® tapered roller bearings, got maximum efficiency, prevented costly well shutdowns.

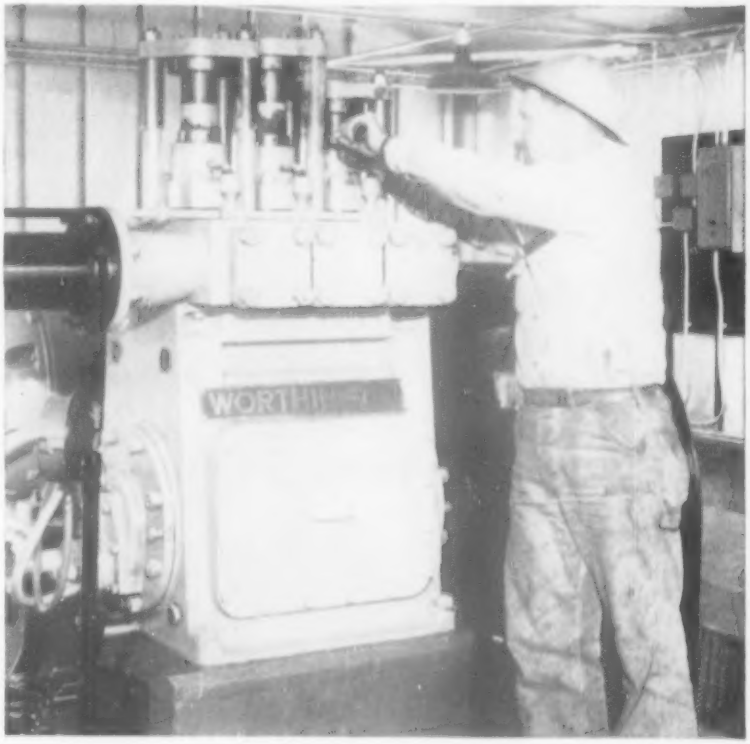
Because of their tapered construction, Timken bearings take both radial and thrust loads in any combination. The crankshaft is held in positive alignment. Wear on crankshaft and adjacent parts is sharply cut. The pump keeps working steadily, dependably. And because Timken bearings keep housings and shafts concentric, closures are more effective. Dirt's kept out, lubricant in, maintenance is reduced to a minimum.

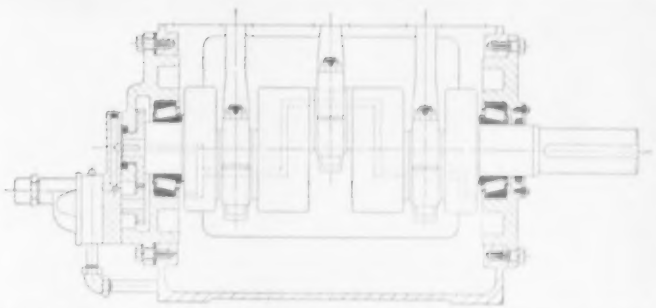
What's more, Timken bearings save power. They practically eliminate friction. Timken bearings are geometrically designed to have true rolling motion, and precision-manufactured to live up to their design. The pump operates smoothly and economically on Timken bearings.

We even make our own fine alloy bearing steel, to be sure it's the finest. We're America's only bearing manufacturer that does.

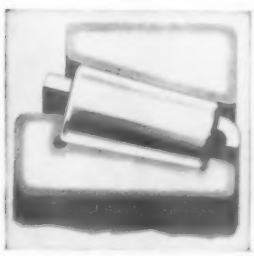
Only Timken bearings give you all these advantages. To get them, always specify Timken bearings on the oil field equipment, or *any* machine, you buy or build. Always look for the trade-mark "Timken" on every bearing. It's your sign of value. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.





HOW WORTHINGTON CORPORATION mounts the crankshaft of its VTE-2 Plunger Pump on Timken bearings to assure dependable performance, reduce wear and maintenance.



HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface over a tough, shock-resisting core. Result: longer bearing life.

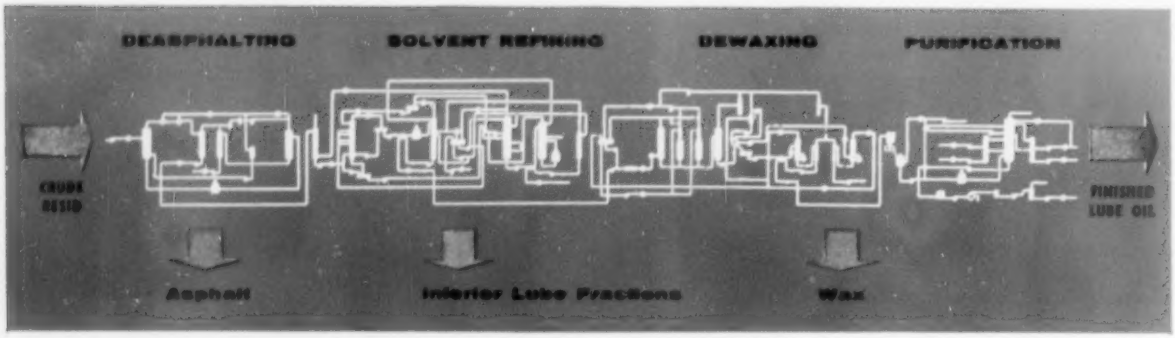
Only Timken tapered roller bearings have these advantages: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. Timken fine alloy steels.

TIMKEN

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER — BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION

lube oils



Foster Wheeler experience points the way to lower cost production

Complete lube oil plant, designed and constructed by Foster Wheeler at England's largest refinery. Process units, in sequence from right to left, are as follows: propane deasphalting, phenol extraction, propane dewaxing and clay contact-vacuum rerun. Foster Wheeler is now building complete lube plants in the United States, Iraq and Venezuela.

NEW ADVANCES in refining processes and equipment have resulted in substantial increases in the overall efficiency of lubricating oil production—contributing to higher sustained output of high quality oils at lower unit production cost.

In the construction of new lube oil plants or modernization of existing facilities, Foster Wheeler's long experience in this specialized field is your best assurance of complete satisfaction, from initial planning to final installation and on-stream service. Foster Wheeler process design engineers offer more than 20 years of continuous and cumulative experience in lube oil manufacture. Their intimate knowledge of all phases of design, engineering and construction—plus their close relationship with all licensor companies—can save time, effort and expense in any expansion or modernization program. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

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Dow is the one producer, you know, supplying caustic soda to industry everywhere. Wherever you produce, you're sure of getting rapid, dependable service from Dow.

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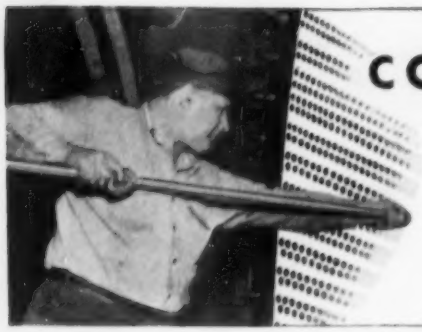
Then, too . . . Dow customers benefit from continual process research, stringent quality control, flexible delivery network. Does Dow have your order? THE DOW CHEMICAL COMPANY, Dept. AL 757C, Midland, Michigan.

you can depend on DOW CHEMICALS

DOW



CONDENSER TUBE CLINIC

Edited by **ARTHUR W. TRACY**, Metallurgical Engineer,
The American Brass Company, Waterbury, Connecticut

Stresses and their Effects can be Minimized

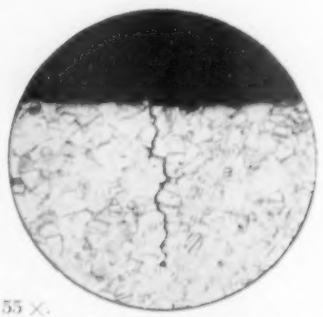
STRESS-CORROSION CRACKING—The stress-corrosion cracking of copper alloys requires the simultaneous action of moisture, air, ammonia, and stress. Stresses may be residual or applied. All Anaconda condenser tubes are processed so as to minimize residual tensile stresses which may be formed during fabrication. Applied stresses from installing tubes in heat exchangers, nonuniform thermal expansion in tube bundles, or misalignment of condensers with other equipment occasionally cause stress-corrosion cracking.

Admiralty metal and aluminum brass tubes, although known to be susceptible to stress-corrosion cracking, seldom crack in condensers. Although ammonia is often present, either by chance or design, in vapors entering condensers, the amount of air (oxygen) is usually so small that the corrosive action of the ammonia is limited. It is obvious that noncondensable gases should be vented from condensers, not only to increase thermal efficiency, but to minimize corrosion.

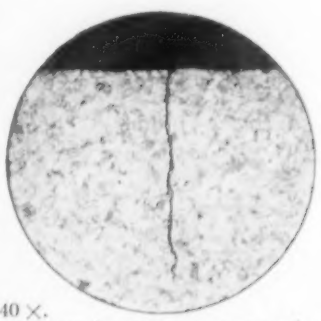
ANACONDA Arsenical Admiralty-439 and ANACONDA Ambraloy-927 condenser tubes seldom stress-corrosion crack in normal service. Where operating conditions are severe enough to cause stress-corrosion cracking of these alloys, ANACONDA Cupro Nickel, 10%-755 and ANACONDA Cupro Nickel, 30%-702 tubes are recommended.

FATIGUE CRACKING—Vibrations from moving parts of equipment or from pressure pulsations can induce stresses in condenser tubes high enough to exceed the endurance limit and cause a fatigue-crack failure. Vibration of a tube may even disturb water flow enough to cause impingement pitting at the point of greatest amplitude of vibration and the resulting pits can act as stress raisers. Pulsations can often be dampened by placing baffles or grids in the path of high-velocity vapors. Vibration of tubes can also be dampened by placing wooden slats between rows of tubes. Cupro Nickel, 30%-702 Tubes are more resistant to fatigue cracking than admiralty and aluminum brass.

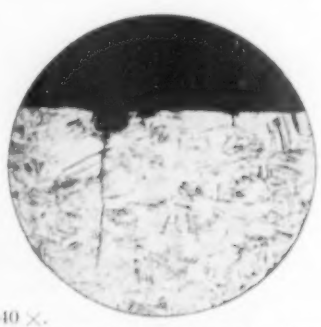
TECHNICAL ASSISTANCE—Your tube problem may need special consideration. We are always ready to advise in the selection of the right alloy to give the best service. Write for the new edition of Publication B-2. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5677



55 ×.
Intergranular stress-corrosion crack in 70/30 brass tube from oil refinery heat exchanger. Longitudinal section.



40 ×.
Transgranular stress-corrosion crack in admiralty metal tube from oil refinery heat exchanger. Longitudinal section.



40 ×.
Fatigue crack starting at pit in aluminum brass tube from power plant condenser. Longitudinal section.

ANACONDA® **Tubes and Plates for Condensers and Heat Exchangers**

Nominal Compositions of Some Anaconda Condenser Tube Alloys

	Arsenical Admiralty -439	Ambraloy -927 (Aluminum Brass)	Cupro Nickel, 10%-755	Cupro Nickel, 30%-702
Copper, %	71	77	88.35	68.90
Nickel, %	..	..	10	30
Zinc, %	27.96	20.96	..	..
Aluminum, %	..	2	..	..
Tin, %	1	..	..	..
Arsenic, %	0.04	0.04	..	..
Manganese, %	..	..	0.40	0.60
Iron, %	..	..	1.25	0.50

Something new in mud

T-8

A Complete Mud Treatment

Simplified Mud Control

Greater Hole Stability

Lower Mud Cost

Proved by extensive field experimentation

WRITE FOR THIS TECHNICAL BULLETIN

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION-HOUSTON

for Deeper, Safer Drilling— New VHS Drilling Lines

• In Louisiana, West Texas, the Williston Basin, the Gulf of Mexico—drillers everywhere are demanding the advantages offered by rotary drilling lines of new LAY-SET VHS. For new VHS lines are 15% stronger than those made of Improved Plow Steel—the strongest grade available before the introduction of VHS.

HIGHER SAFETY FACTOR

Obviously this means a higher safety factor. For example, 10 lines of VHS have a safety factor about equivalent to 12 lines of Improved Plow Steel. Or, with 10 lines of VHS you get a safety factor 14.9% or 15% higher than with 10 lines of IPS.

SAVE TIME!

With stronger VHS you can drill deeper before increasing the number of parts of line. You can make round trips faster. And the extra strength of VHS eliminates in many cases any necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factor.

TOUGHER, TOO!

In addition to its greater strength VHS is tougher. It has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. Following regular, adaptable cut-off practices should result in ton-mile advantages.

IN STOCK NOW

Call your Hazard distributor for LAY-SET VHS drilling lines in the length and diameter you need. He probably has them in stock—or he can get them fast. You don't need any complicated specifications.

for further information write to the nearest Hazard office for Brochure **DH-522**

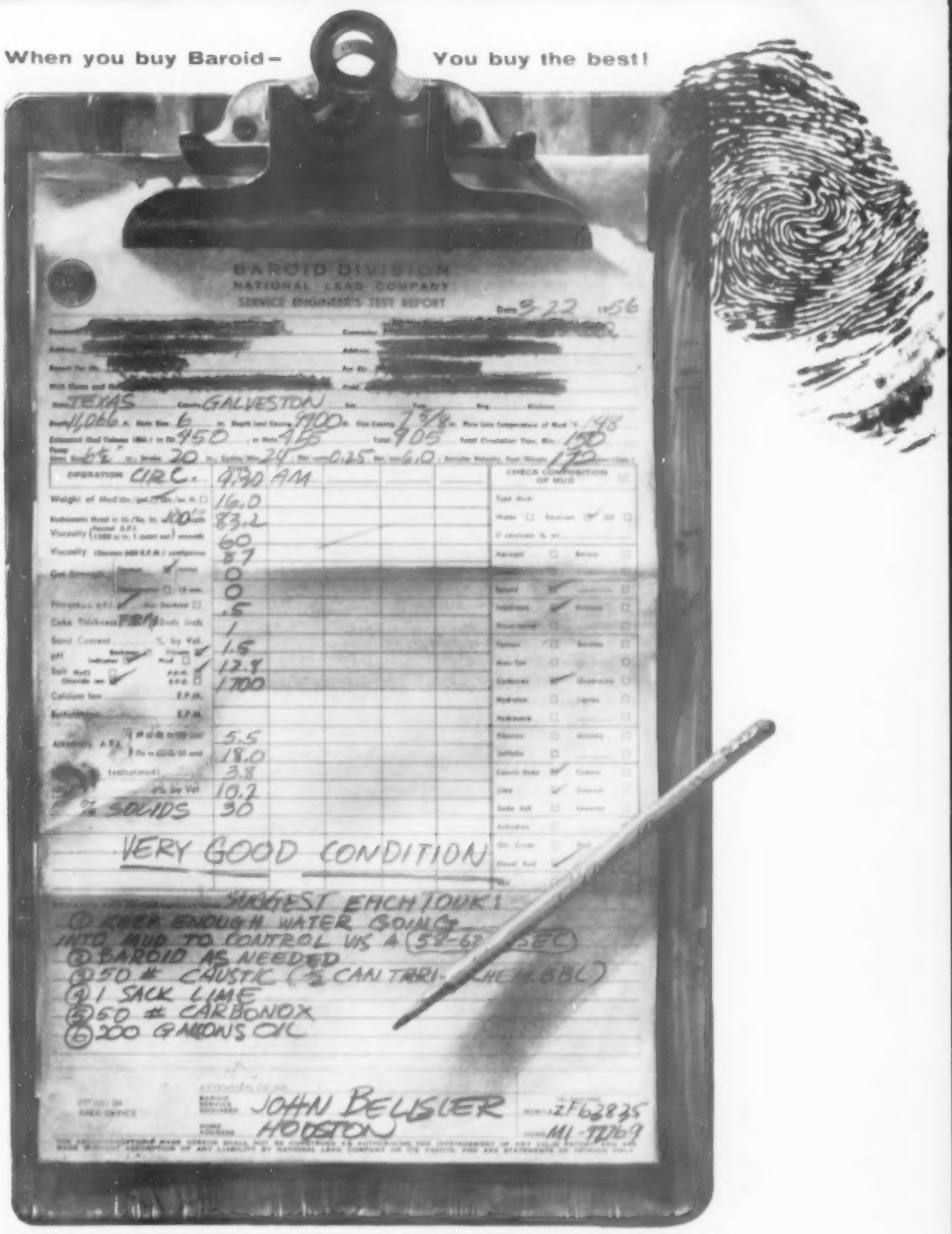
HAZARD WIRE ROPE DIVISION
American Chain & Cable Company, Inc.

630 McFarland St. Houston 1, Texas | 4555 E. 46th Ave. Denver 16, Colorado | 2216 S. Garfield Ave. Los Angeles 22, Calif. | 400 W. Madison St. Chicago 6, Ill.

Wilkes-Barre, Pa.; Odessa, Texas; New York, N. Y.; Philadelphia, Pa.; San Francisco, Calif.

LAY-SET VHS 15% Stronger • Tougher •

When you buy Baroid – You buy the best!



OVER 1,000,000 "FINGERPRINTS" help BAROID cut your mud costs

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

Classified at seven Baroid area offices near you are the results of over 1,000,000 mud test reports . . . valuable "fingerprints" of mud programs in your area. Baroid engineers have accurate records there to plan an honest, economical mud program. No other mud company can match these "fingerprint" files. Just one of the reasons why your Baroid mud program costs you less.

7 AREA HEADQUARTERS: HOUSTON • TULSA • LOS ANGELES • DENVER • CALGARY • MIDLAND • NEW ORLEANS

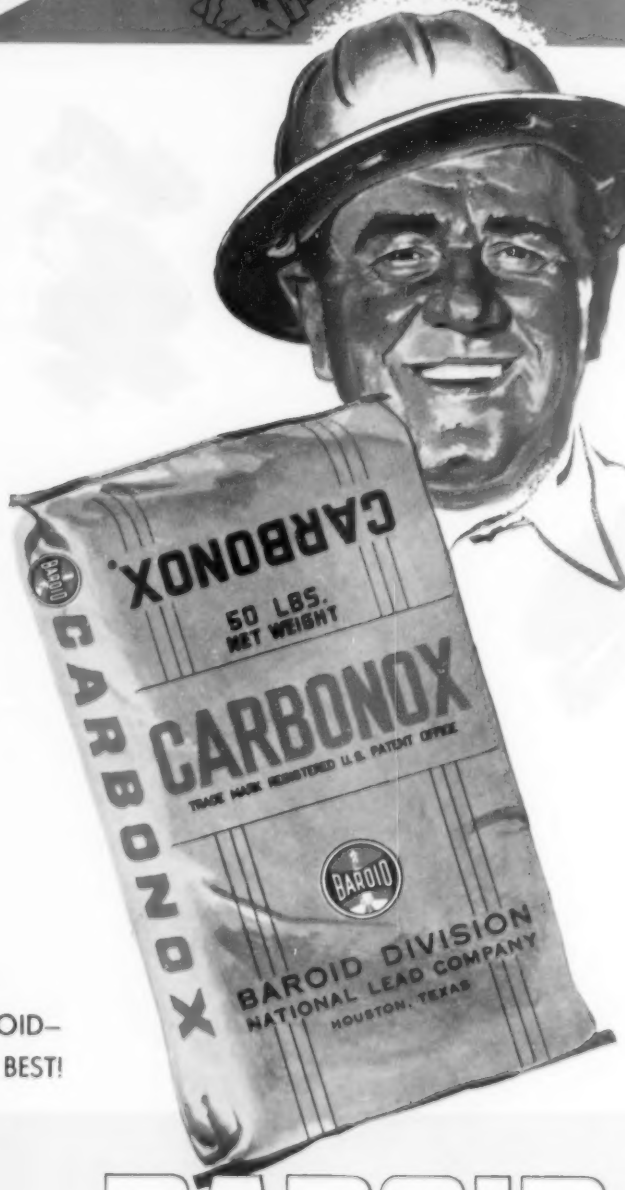
When your mud makes you feel like this...

USE CARBONOX
a Baroid original

No other single mud product can help you lick so many different mud problems: Carbonox is a thinner and gel reducer, an aid in filtration rate control, an efficient emulsifier, and even prevents the tendency of lime muds to solidify at high temperatures.

Ten years of successful field use in all types of mud, all areas and all drilling depths have proved the efficiency and economy of Carbonox.

No wonder mud troubleshooters turn first to Carbonox, another money-saving chemical developed and introduced exclusively by Baroid.



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YOU BUY THE BEST!

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Please send me your latest technical data on Carbonox.

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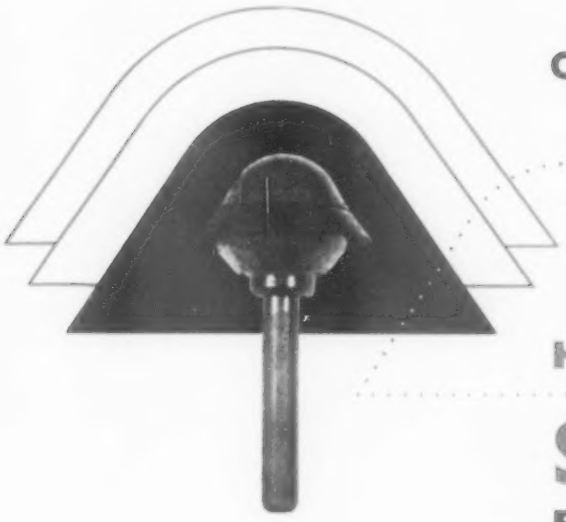


Cone-Shaped for Reliable Shutoff

HALLIBURTON'S

SUPER SEAL
FLOATING EQUIPMENT

Instant, positive acting seal against fluid pressures . . . wide opening for full, free cement passage. That's the beauty of Halliburton's Super Seal Floating Equipment. Its cone-shaped valve has twice the sealing area of ball-and-seat construction. And its cone shape also provides larger opening, making it easier to pump through.

RESISTS ABRASIVE WEAR

The unique design of Halliburton's Super Seal also reduces abrasive wear by providing for smoother flow between cone and seat, while it reduces abrasive velocity. This minimizes turbulence and resulting abrasion caused by scouring action. The tough, rubber seal ring not only provides greater sealing area; its resilience makes for more perfect seating. In tests under pressures to 15,000 psi, a perfect leak-proof shutoff was secured every time.
The valve assembly, with exception of the aluminum valve spring, bolt and rubber seal ring, is constructed of a phenolic impact compound having a greater compressive strength than is normally required. Being inert to most acids and solvents, it is not affected by well fluids.

MEETS PRESSURE DEMANDS

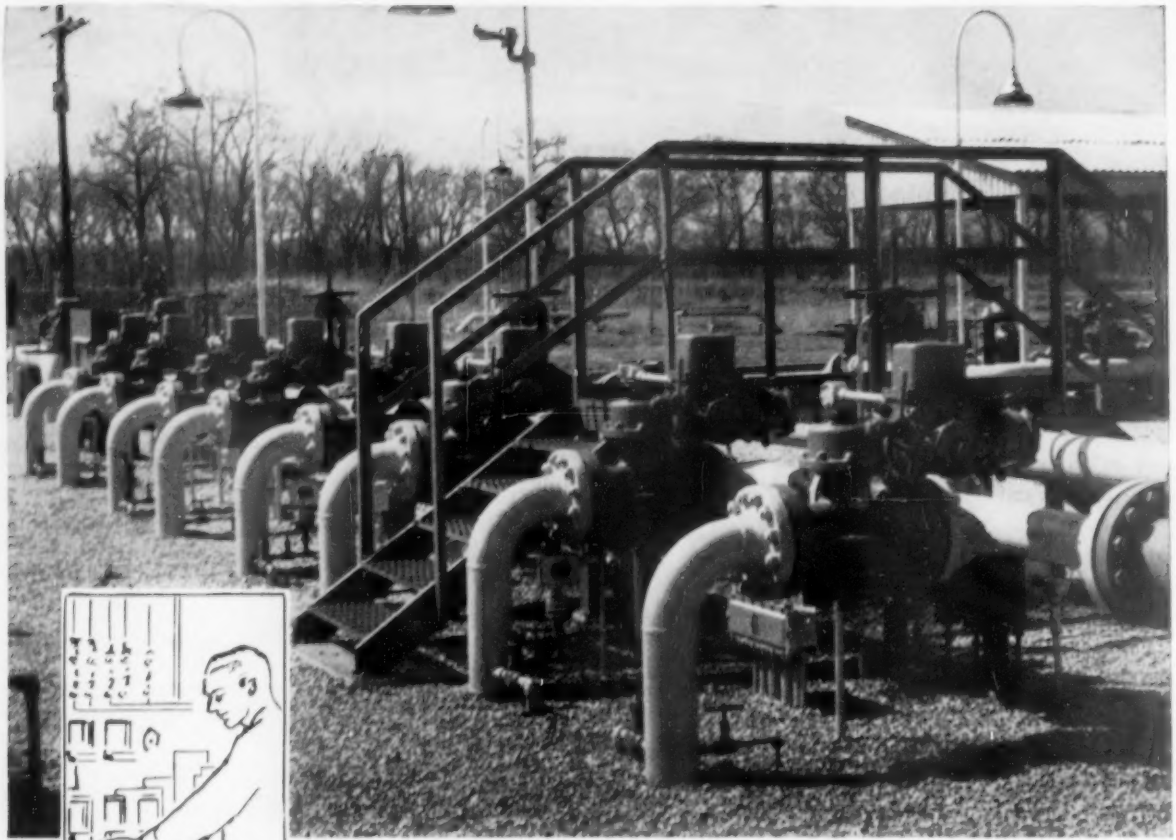
The higher the pressure . . . the tighter the seal with Super-Seal Floating Equipment. That's because of the positive action of the cone-shaped valve and its larger cone-shaped seat. Another example of know-how by Halliburton, out of 3-million-job experience. From this unmatched background comes the dependable performance that makes Halliburton's SUPER SEAL Floating Equipment the most popular in the business.

Get the protection of more reliable shutoff by using Halliburton's field-tested Super Seal Floating Equipment. For complete data, call your nearest local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON
CEMENTING SERVICES

COMPLETE DATA SENT ON REQUEST
Get this valuable information for your Halliburton Service File

251 SERVICE CENTERS — JUST MINUTES AWAY FROM ANY RIG

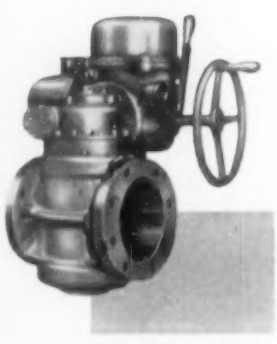


PUSH-BUTTON operation of plug valves . . . in modern pipeline station

Send for Catalog L-550, and please use your Business Letterhead when requesting.

The eight LimiTorque Electrically Controlled Valve Operators shown above, installed on plug valves, are in daily operation at this ultra-modern products pipeline station. LimiTorque opens and closes plug and gate valves throughout this entire pipeline network . . . From central control panels, the exact position of each valve can always be determined—opening, closing or stopping at the will of the operator.

In countless refineries and pipelines throughout the World, LimiTorque push-button operators assure simplicity, safety, economy and true dependability under all operating and climatic conditions . . . It is significant that far more LimiTorque Operators are used in the entire petroleum industry, than all others combined.



A type SM LimiTorque mounted on a 6" plug valve —note compactness and sturdiness of the installation.

LimiTorque®

PHILADELPHIA GEAR WORKS, INC.
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.
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Never too busy to pass the time o' day

Been in to meet the boys at the local Bethlehem Supply store? If not, it's high time you get acquainted with 'em.

They're a friendly bunch. Always glad to do you a favor. Always glad to pass the time o' day. A Bethlehem store is a place where you can be sure of getting help and service.

We have an even 60 of these clean, pleasant stores throughout the oil fields, and more to come. They're all the way from Illinois to California; from Tioga, North Dakota, to the Gulf Coast. Each is fully stocked with drilling, production, pipe-line and other equipment—everything needed to meet the demands of the area served. Look over our stock; you'll see what we mean.

Whether you come for supplies or just to say hello, you're always welcome at any Bethlehem store. Drop in and visit the nearest one. Our people will do their best to make you feel at home.

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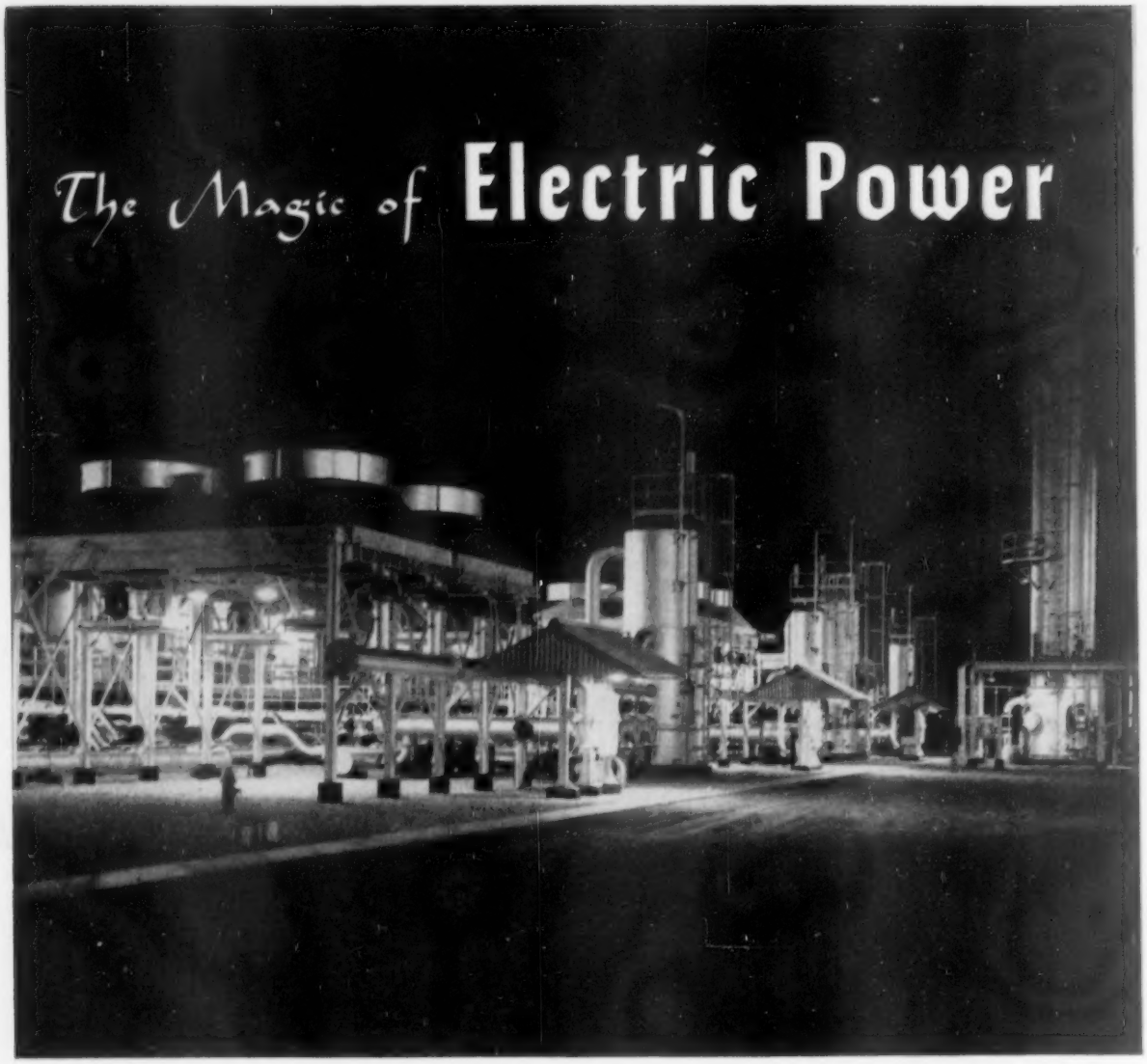
BETHLEHEM SUPPLY

BETHLEHEM STEEL

BETHLEHEM SUPPLY

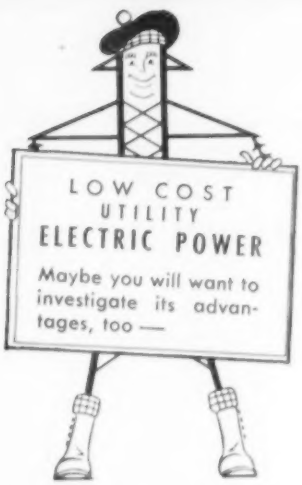
The Magic of Electric Power



Service . . . Dependable Service

Next to a captivating sunset nothing has such a magical appearance as a giant refinery flooded by the grandeur of electric light on a pitch dark night.

Spectators view it with unceasing awe — Businessmen view it as a well-lighted, efficiently powered investment. Over 72 per cent of this nation's refineries utilize dependable purchased Electric Power. More cost conscious men are specifying it every year.



WRITE PETROLEUM ELECTRIC POWER ASSOCIATION, P. O. BOX 2771, DALLAS, TEXAS, OR CALL THE SALES ENGINEER OF YOUR LOCAL UTILITY ELECTRIC POWER COMPANY — NOW

CREATIVE BANKING

and the stopped pumps

Creative banking represents more than an interest in your problem. It begins with a detailed knowledge of current conditions, such as lower allowables, stopped pumps. And from this knowledge of the oilman's problems, the ground work to help is laid.

Creative banking works for you. Creative banking means financing flexible enough to help you when help is needed; flexible enough to meet changing conditions as they arise. It means no hard and fast rules to hamper sound financial planning and assistance. Creative banking at The National Bank of Commerce gives you the financial help you need rather than imposing a financial burden.

The experience and resources of The National Bank of Commerce of Houston are now being used in Wyoming, Colorado, New Mexico, Texas, Louisiana, and Mississippi.

E. O. Buck, *Vice President, Oil Loan Department.*

THE NATIONAL BANK OF

COMMERCE

OF HOUSTON *Gulf Building — 712 Main Street, Houston, Texas*

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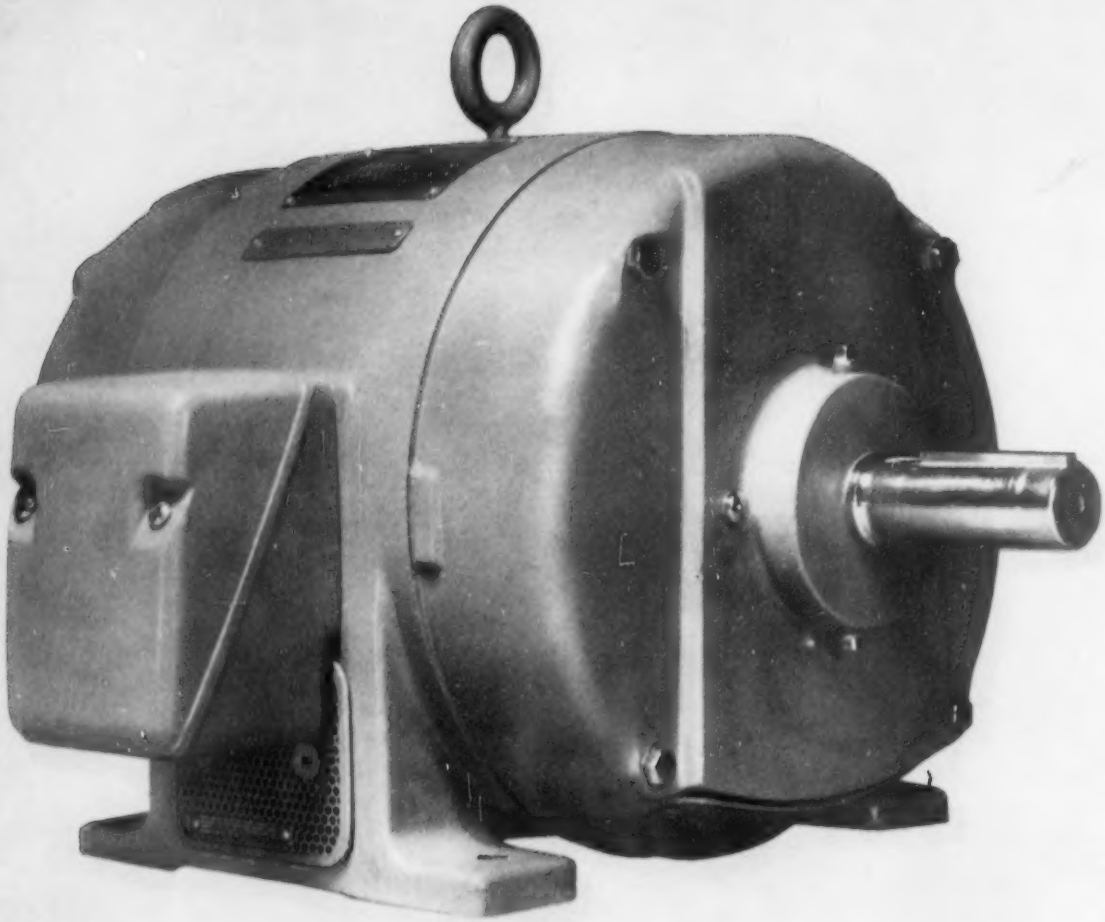


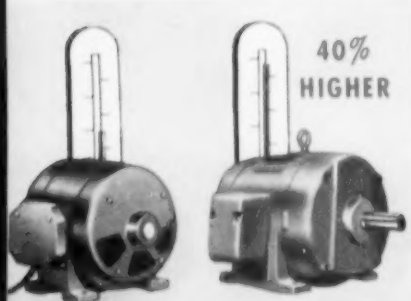
General Electric's NEW

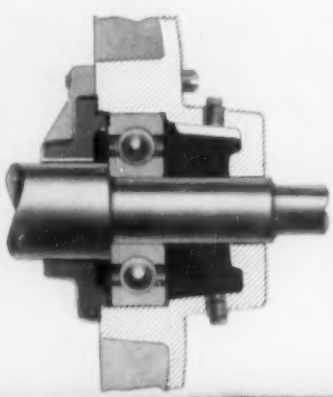
INSTALL IT...

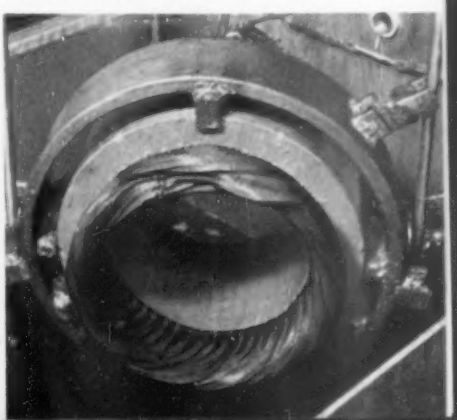
HEAT PROTECTION—Alkanex*, a revolutionary new wire enamel used in the field windings, allows up to 40% higher temperature rise than is possible in ordinary motors, virtually eliminates burnouts.

DUST PROTECTION—Closely machined bearing caps and housing on each side of bearings, plus the new G-E Tri-Clad "55" oil field motor's low velocity air intake system, keep dirt and dust out of vital parts, help give added protection for longer, trouble-free operation.

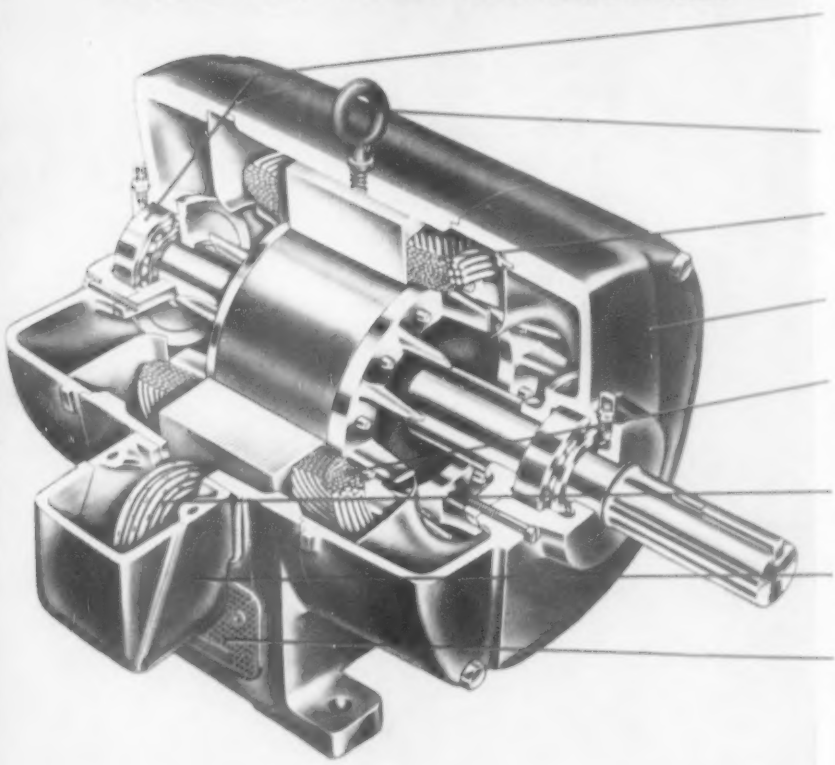
MOISTURE PROTECTION—Field windings, coated with water-shedding silicone Dri-Film*, plus cast-iron frame construction and close fits between all joining surfaces, help prevent motor failure due to moisture.







PACKED WITH MONEY-SAVING FEATURES



1. Advanced bearing system will last longer without regreasing than any other motor bearing system.

2. Convenient eyebolt cuts installation time, —permits easier handling.

3. Water-shedding stator windings virtually eliminate breakdown due to moisture.

4. Rugged cast-iron frame helps prevent corrosion and accidental damage.

5. Class 'B' insulation system with revolutionary Alkanex* wire enamel allows up to 40% higher temperature rise.

6. Perma-numbered leads are easy to read even when taped or clipped.

7. Easy-access conduit box is large and roomy for fast wiring.

8. Removable screens protect motor against damage from rodents and rocks.

*Registered trade-mark of General Electric Company.

TRI 55 CLAD oil field motor

REG U.S. PAT. OFF.

FORGET IT!

General Electric's all-new Tri-Clad "55" oil field motor is specially designed and engineered for long, trouble-free operation on rugged, outdoor pumping applications.

This motor will run far longer without attention than ordinary motors because it is protected against heat, dust and moisture. Burnouts have been virtually eliminated by the use of Class 'B' insulation made from new "miracle" materials Alkanex, heat-resistant enamel wire, and Mylar† mica-glass laminate slot and phase insulation.

The high heat resistance of this new insulation means you get more horsepower per pound in a more compact, cast-iron frame, because of higher temperature protection possible with Alkanex. The large grease reservoir and revolutionary bearing system has reduced normal maintenance to a few minutes every five years. The eyebolt, large roomy conduit box and perma-numbered leads —"extras" at no extra cost—cut installation time to a minimum.

A new G-E oil field motor on your pumping rig is easily your most economical buy. Install it . . . forget it. For more information write for Bulletin GEA-6546 or contact your nearest General Electric Motor Distributor, or G-E Apparatus Sales Office. 8774

†DuPont trade-mark

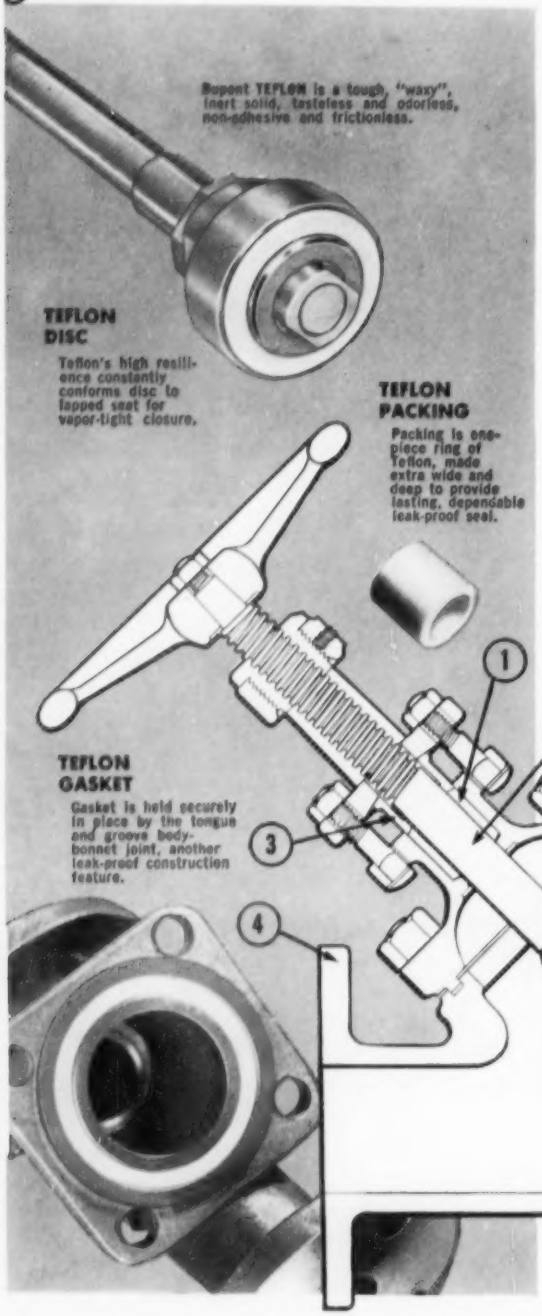
MEDIUM INDUCTION MOTOR DEPARTMENT

Schenectady 5, New York

Progress Is Our Most Important Product

GENERAL ELECTRIC

Jenkins designed for trouble-free performance . . . a


Dupont TEFLON is a tough, "waxy", inert solid, tasteless and odorless, non-adhesive and frictionless.
TEFLON DISC
Teflon's high resilience constantly conforms disc to lapped seat for vapor-tight closure.
TEFLON PACKING
Packing is one-piece ring of Teflon, made extra wide and deep to provide lasting, dependable leak-proof seal.
TEFLON GASKET
Gasket is held securely in place by the tongue and groove body-bonnet joint, another leak-proof construction feature.
1
2
3
4

STAINLESS STEEL "Y"

to lower costs in a wider range of

CORROSIVE SERVICES

For food and chemcial plants, and similar services, Jenkins Fig. 1335 "Y" Globe offers many advanced features that will lower operating costs and keep your processing lines trouble-free. The disc, packing, and gasket are tough, resilient Teflon. Tasteless and odorless, it eliminates problems of contamination.

The "Y" pattern permits full flow, nearly equal to that of a gate valve, and also provides the vapor-tight closure and the ease of disc renewal of a globe valve.

Fig. 1335 offers extra value by any test . . . *initial cost, operating efficiency, low maintenance.* You can convert this extra value into *extra savings* on your toughest corrosive services. Call your Jenkins Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17.

FULL, FREE FLOW
through Fig. 1335 is nearly equal to flow through a gate valve.

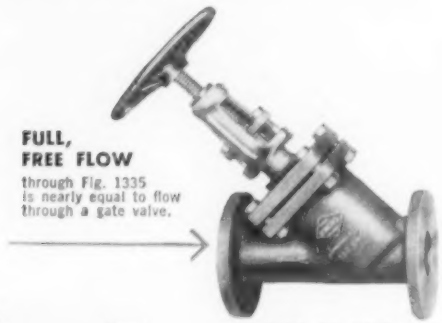


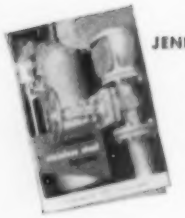
Fig. 1335 "Y" GLOBE
150 lbs. O.W.G. at 500°F
230 lbs. O.W.G. at 100°F
Sizes 1" to 4"

(1) **Packing Box**—Exceptionally deep and wide to hold optimum size packing.

(2) **Spindle**—Polished shank, long-operating threads, bevel shoulder for backseating.

(3) **Gland**—Two-piece for equalized pressure, tight seal.

(4) **Flanges**—Conform to M.S.S. Standard Practice S.P.42 Specifications.



JENKINS STAINLESS STEEL VALVE BOOKLET illustrates and describes wide range of Jenkins Globe, Gate, Check, and Y Valves, includes selection data, survey forms. Ask for Form 200-A.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros.

The coatings that, up-to-date, have extended the life of this oil equipment more than 24 times were applied by **Mid-Continent Plastic Co.**, Odessa, Tex.

24 times the service life and still going strong

...that's how the right coating can cut costs

This battery of Texas oil tanks shows a large ¼-in. steel gunbarrel tank in the foreground. It is used to separate salt water from crude oil. Both the salt and the hydrogen sulphide in the oil are highly corrosive.

The gunbarrel tank was installed brand new. Within 30 days a hole appeared in its side. This was patched, and noticeable thin spots reinforced. Only 30 days more and leaking began again. Thus, after two months, two alternatives remained—replace the tank or try protective finishes. Coatings based on BAKELITE Brand Vinyl Resins were recommended and applied by spray, after sandblasting. That was over 4 years ago. *No further corrosion trouble has been experienced, and the coating is still in excellent condition.*

Whatever, or wherever your equipment or structure, it can pay *you* to investigate the specialized formulations based on BAKELITE Resins available from many coating suppliers. Call them, or write for a free copy of our booklet, "BAKELITE Resins Coatings for the Petroleum Industry." Address Dept. U K-128.

BAKELITE
BRAND
RESINS for COATINGS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC.

NORDBERG SUPAIRTHERMAL® ENGINES

. . . your best investment in long term – low cost PIPE LINE POWER

NORDBERG has an enviable record of more than forty years of specialized experience in the field of heavy duty internal combustion engine design and manufacturing experience. The purchase of Busch-Sulzer Bros. Diesel Engine Company in 1946 brought together two of America's outstanding engine builders . . . Nordberg, leader in the large engine field, and Busch-Sulzer, builder of the first successful Diesel to go into regular service in 1898.

Recognizing the constant demand for better, more efficient and dependable prime movers, Nordberg has continually designed and built the finest engines that modern technical knowledge, facilities and experience could produce.

This sound combination has proved, through hundreds of pipe line installations that Nordberg Engines have set, and are continuing to set, new standards of performance for efficient, low cost pipe line pumping operations . . . on crude, products and gas lines.

Backed by this broad experience and proved performance, today's modern line of Nordberg SUPAIRTHERMAL Engines are, by all standards, your best investment in modern prime movers for compact, economical, long term pipe line power. These engines are built in both in-line and V-types, in sizes from 500 up to 5,000 hp, for Diesel, Duafuel® or Spark-Ignition Gas operation.

We welcome your inquiry and the opportunity to assist you in your power study.

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

Q356

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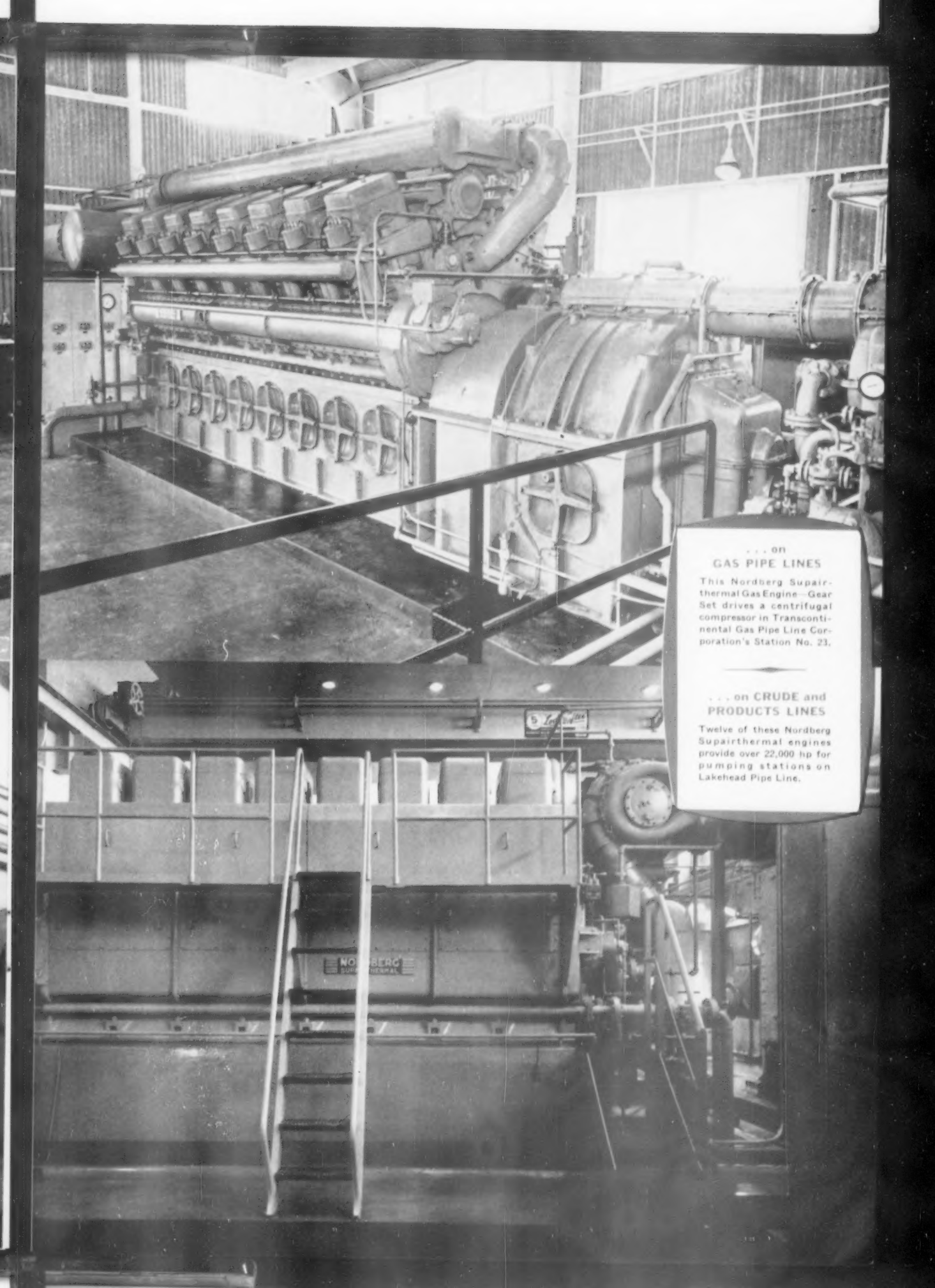
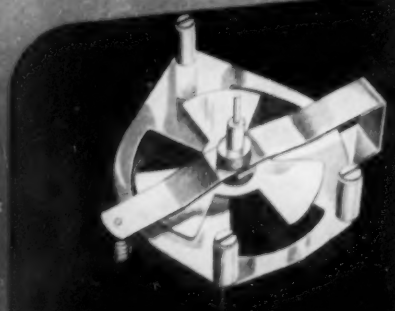
NORDBERG MFG. CO., Milwaukee, Wisconsin


. . . on
GAS PIPE LINES
This Nordberg Supairthermal Gas Engine—Gear Set drives a centrifugal compressor in Transcontinental Gas Pipe Line Corporation's Station No. 23.
. . . on CRUDE and PRODUCTS LINES
Twelve of these Nordberg Supairthermal engines provide over 22,000 hp for pumping stations on Lakehead Pipe Line.



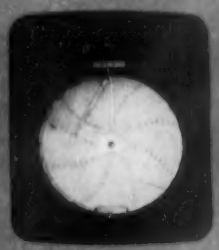
In DYNALOG Instruments, a simple, radio-type, variable capacitor replaces the troublesome slidewire — gives unmatched smoothness of balancing.

this
potentiometer
has
no slidewire

STEPLESS CAPACITY-BALANCING PROVIDES SPEED WITHOUT WEAR!

Friction-free balancing action! That's why Dynalog responds almost instantly to the slightest changes in a process variable . . . without wear . . . with *lasting* high accuracy.

The DYNALOG has no fast-moving parts . . . and no gears, cables, or complicated mechanisms to slow response. Sensitivity isn't limited by slidewire windings. A simple, variable capacitor and positive magnetic drive provide continuous, stepless balancing with a sensitivity of 1/100 of 1% . . . an accuracy of ¼ of 1%. And DYNALOG is never "off process" for standardizing — it requires *none*. There are no batteries to replace . . . no motors to periodically clean and lubricate. Only five moving parts!



DYNALOG's* EXCLUSIVE BALANCING ACTION

- no slidewire
- no batteries
- no standardizing
- no gears, cables, etc.
- no high-speed reversing motor

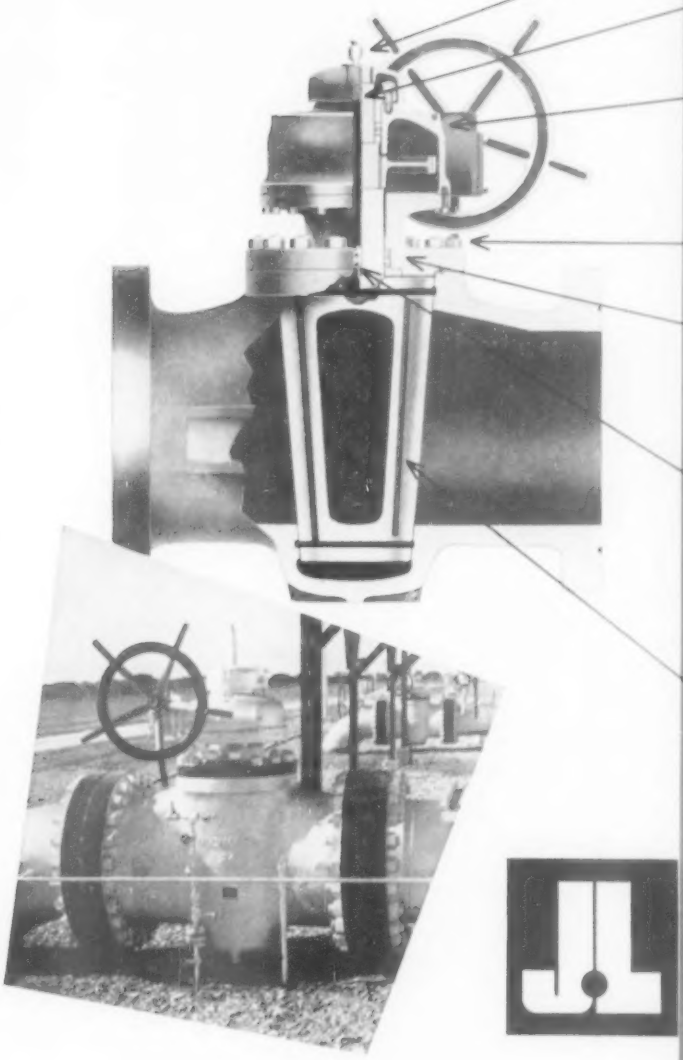
DYNALOG Instruments can be used with resistance, voltage, capacity, or inductive type primary elements to measure and/or control any process variable with unmatched speed and accuracy. Write for Bulletin 427. The Foxboro Company, 6010 Neponset Ave., Foxboro, Mass., U.S.A.

**Reg. U.S. Pat. Off.*

FOXBORO
*Reg. U.S. Pat. Off.

DYNALOG
ELECTRONIC INSTRUMENTS

LET'S EXAMINE WALWORTH LUBRICATED PLUG VALVES



- Button-head lubricant fitting and lubricant screw. Screw is not removed when using a Walworth High Pressure Lubricant Gun.
- Lubricant-Fitting screw has "Telltale" safety groove.
- For buried pipelines this yoke design permits simple attachment of hand wheel and lubrication extensions without modifying the gearcase.
- Standard bolt threads, rather than special threads, permit easy replacement from local stocks.
- Two overlapping Teflon packing rings form an effective seal against leakage without "grabbing" the plug shank. Packing serves only as a seal and is not used to hold the plug in its seat.
- In the stainless steel check valve unit, a transverse pin holds two balls in their seats. There is no chance for line pressure to get into the lubricant system when the valve is properly adjusted and lubricated.
- Lubricant grooves completely frame the port openings and encircle the plug at the top and bottom, assuring a tight seal against leaks. Bottom circumferential groove is separate from, but connected with, the lubricant well.

ADVANTAGES OF PLUG VALVES

1. Quick Opening.
2. Positive seal on Light Hydrocarbons.
3. Less space than Gate Valves.
4. Available in Three-Way and Four-Way.
5. Can be used with Locking Device.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

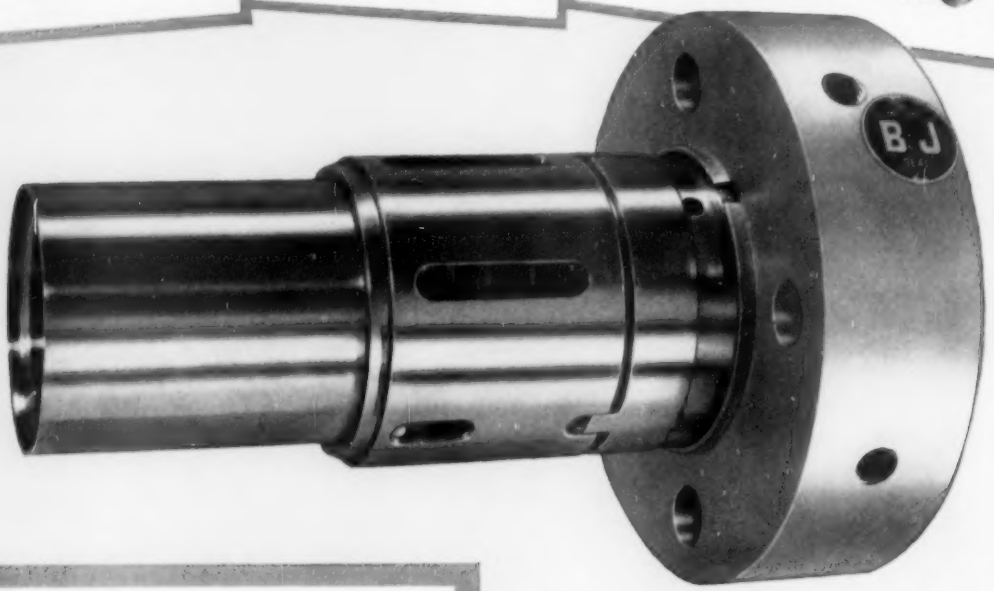
SERVING THE UNITED STATES AND CANADA

125-G

This ONE BJ Mechanical Seal...

Answers THREE Pumping Services...

With only the change of GASKETS!



1 **HIGH OR LOW TEMPERATURES**
The BJ *ASBESTOS* GASKETS handle temperatures from minus 100°F to plus 650°F.

2 **CORROSIVE**
The BJ *TEFLON* GASKETS answer a wide range of corrosive fluids.

3 **HIGH PRESSURE**
The BJ *RUBBER* GASKETS handle pressures to 1000 PSI . . . and any general service needs.

This *one* basic Byron Jackson Type U Mechanical Seal solves *three* major pumping services with only the change of two gaskets. You benefit because: (a) you can *standardize* on this basic BJ Type U Seal and thus greatly reduce your parts and inventory needs; (b) you can convert process pumps to changes of service with only the change of two gaskets; and (c) you *eliminate* costly, troublesome stuffingbox repacking and unnecessary pump downtime.

Only Byron Jackson . . . the leader in Mechanical Seals . . . offers this simplified interchangeability of service through a change of gaskets.

If your operations involve multiple pumps with variations in service requirements, look into this basic BJ Type U Seal. If your pumping needs are more highly specialized in any one field, there's a BJ Mechanical Seal engineered to solve almost every stuffingbox requirement.

FREE MECHANICAL SEAL SELECTION PORTFOLIO – Send for this special Byron Jackson Mechanical Seal Selection Portfolio. Includes size, material, price and installation information. Write today to:

Byron Jackson Pumps
INC.
A Subsidiary of Borg-Warner Corporation
P.O. Box 2017A, Terminal Annex
Los Angeles 54, California

BJ

When You Have Places "Hard-to-Reach"

Use PROTO-TAC Ratchet Wrenches

with the Famous Open-End Ratcheting Principle

They Work Like Magic... Save Time ... Save Money. Using the exclusive and patented open-end ratcheting principle, these wrenches perform jobs that are otherwise difficult or even impossible to handle. They work in close quarters, over and around tubing and other obstructions, on hidden bolts or nuts, and in recesses or wells. Buy these revolutionary, time-saving tools from your PROTO dealer. Send 10¢ for catalog of entire line to

PROTO TOOLS
2215 Santa Fe Ave.,
Los Angeles 54, Calif.

Closed Socket Type Ratchet Wrench
⅜"-1⅛" Openings

Crowfoot Type Ratchet Wrench
⅜"-3" Openings

In addition to the three types of ratchet wrenches illustrated, the PROTO-TAC line includes ratcheting box wrenches, screwdriver attachments, rigid heads, and adapters for turnbuckles, standard sockets and internal wrenching.

Eastern Factory, Jamestown, N.Y. Canadian Factory, London, Ont.

A5685

PROTO TAC TOOLS
PROTO means PROfessional TOols

They Say—

Thye's 900 Telegrams

"Last January when the United States was considering the Federal Gas Bill, Minnesota's Republican Senator Thye announced he had changed his mind and intended voting for the controversial bill, freeing the companies from federal regulation, largely in response to some 900 telegrams from 'constituents.'

"... The Senate Lobbying Committee determined that these telegrams were not sent by constituents, but, in fact, came mostly from oil-company agents using constituents' names without their knowledge!

"Such unethical and even fraudulent lobbying has been disavowed by oil executives themselves. The probe can do much to restrain—by law, if necessary—those unauthorized agents who would make a travesty of present lobby laws."

Editorial in the Boston Daily Globe.

Prior's Telegram Statement

"You may have read or heard recently about a Senate committee's investigation of some Standard Oilers' activities in connection with the Harris-Fulbright natural-gas bill. We think you deserve to know all the facts and your company's attitude toward them.

"Some Minnesota employes of the company tried to get people in the state to wire their senior senator, Edward Thye, urging him to vote for the Harris-Fulbright bill. These employes were responsible for the sending of about 887 telegrams. On instructions from division headquarters the employes paid for the telegrams if the people sending them weren't willing to pay. About 835 telegrams were paid for by the company.

"Two salesmen, acting entirely on their own without company knowledge, signed names to a number of wires without ever getting approval of the people whose names they used. There were about 30 such telegrams among the 887 sent. Two other salesmen, also on their own, got the approval of some of the people only after the telegrams already had been sent.

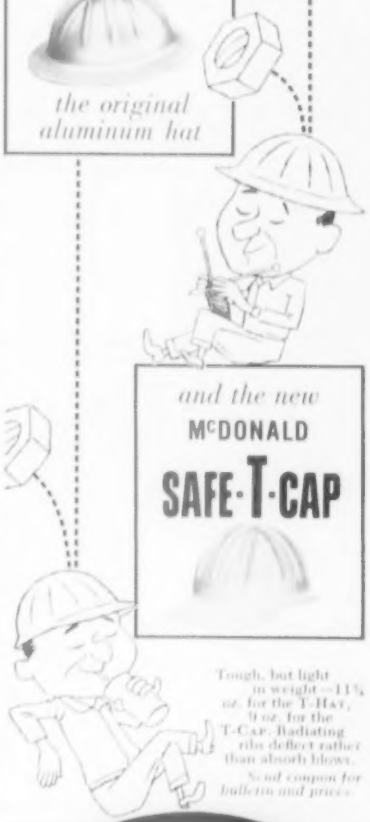
"... Here's our stand on these points:

"1. We think it was completely proper to ask Minnesotans to send wires to their representatives in Congress. In a nation like ours the people have a right and a duty to express their views to their senators and representatives. We as a company have a right and a duty to rally support for

McDONALD PRODUCTS
Safety Designed...
with comfort in mind!

famous
McDONALD
SAFE-T-HAT

the original aluminum hat



and the new
McDONALD
SAFE-T-CAP

Tough, but light in weight—11¾ oz. for the T-HAT, 9 oz. for the T-CAP. Radiating ribs deflect rather than absorb blows.

Send coupon for bulletin and prices.

B-F-McDonald Co.
Manufacturers & Distributors of Industrial Safety Equipment

5721 WEST 96th ST., LOS ANGELES 45, CALIF.
Other Offices in San Francisco and Houston

Please send information and prices on SAFE-T-HAT AND SAFE-T-CAP.

NAME
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ADDRESS
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COLD facts about a HOT subject . . .

Stewart Stoves

● Decide right now to replace make-shift heating facilities this winter with clean, safe, dependable Stewart Stoves.

Equipped with regular Stewart Hi-Efficiency B-4 gas burners—"The Burner without an equal"—Stewart Stoves provide plenty of heat at low cost, for derrick floors, warehouses, supply stores, garages, industrial plants, etc.

They are furnished for use with either natural, butane, propane or manufactured gas—furnished with or without vents.

Natural gas stoves furnished with gas valves, pilot light and pressure regulator. Butane stoves do not have pilot light and pressure regulator.

CONSTRUCTION: Bodies are heavy sheet steel. Rounded top, baffle plates and legs are cast iron. Finished with high temperature aluminum paint.

TWO SIZES:

Model 15: 50,000 BTU, 35" high by 19" O.D. Wt. 100 lbs.

Model 20: 150,000 BTU, 48" high by 24" O.D. Wt. 200 lbs.

When ordering, specify gas to be used.

U-10-55

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

fmc

our stand on any issue, especially one as vital to us as the one that was at stake in this instance. As long as we're open and above-board no one can properly criticize us or any employes who help us.

"2. We believe it was improper for the company to pay for any of the telegrams. This was a mistake. We are not going to deduct the cost of these telegrams (about $1,500) on our income-tax return because we don't consider this a proper business expense.

"3. We strongly condemn the practice of signing telegrams or letters or anything else without the approval of the person whose name is used. Any way you look at it, this is just plain wrong.

"We've already taken steps to make sure nothing like this incident will ever be repeated. We are not going to discipline any of the people involved, because we think that wouldn't be fair. The mistakes made were mistakes of judgment, and they were made in overenthusiasm for a cause about which most of our people felt very deeply. . . .

"Your company management got into the natural-gas fight because we're convinced both the company welfare and the public interest were involved. We can't have a progressive nation if freedom of competition and private enterprise are curtailed. For this reason we have every intention of continuing to fight to free the natural-gas producers from unnecessary utility-type controls that can only hurt the nation. We'll again be asking your help in the campaign—and in other campaigns that we think concern the fundamentals of the economy.

". . . While we want you to be interested in political matters and legislative affairs, we never want you to act against your convictions. . . . If you don't agree with us and want to say so, that's your privilege. . . ."

Frank O. Prior, president, Standard Oil Co. (Ind.), in a letter to Standard Oil employes.

An Industry of Political Amateurs

"Frank O. Prior put his oil company, the Standard of Indiana, on record (in testimony at the Senate hearings on lobbying for the Harris-Fulbright natural-gas bill) as a vigorous protagonist for the kind of legislation it thinks will be good for the industry and the country.

"Why shouldn't the company and the industry present its views with all the talent and energy it possesses? This is still a country of free speech and the right to appeal to Congress. The fellow who doesn't cry out when he is pinched is apt to be smothered in the next go-round.

"But oil men despite their great scien-

PETROLEOS MEXICANOS

Gas Processing Plant

REYNOSA, MEXICO

Below the Rio Grande, near Reynosa, in Tamaulipas, Mexico, Petroleos Mexicanos has recently completed this major gas processing project designed to process 300 million cubic feet of natural gas daily gathered from numerous fields within an area of about 400 square miles. About 8,000 barrels per day of fractionated products, including propane, butanes, motor fuel, naphtha and kerosene will be produced.

Engineering design and procurement of equipment was entrusted to Hudson, and the satisfaction of our client is attested by a current contract for a similar but even larger project for Petroleos Mexicanos on the Isthmus of Tehuantepec.

DESIGNERS AND CONSTRUCTORS OF
OIL AND GAS PROCESSING PLANTS

HUDSON
ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

Serving Industry with

MODERN METHODS

for Joining Metals

SIGMA WELDING

A high speed, automatic fusion welding process. . . . Employs argon gas to protect weld area from contamination. Joins all commercially fabricated metals, and attains high production speeds in all operations. Manual and automatic mechanized equipment is available.

"UNIONMELT" WELDING

Makes sound welds up to 1½ in. thick in one pass. This plus high welding speeds make it the most economical process for a wide range of fabricating and repair jobs. Both portable manual, and automatic mechanized setups are available.

"HELIARC" WELDING

Ideal for light gage metals. . . . Joins all commercial metals. Welding can be done in all positions on all types of joints with portable manual, semi-automatic, and fully automatic mechanized equipment. Operations are fast and efficient.

OXY-ACETYLENE WELDING, BRAZING, AND SOLDERING

Permits fabrication and repair of a wide range of structures and parts made of metal. Ideal tools for small shop jobs, to production line operations by large manufacturers.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY

Division of Union Carbide Canada Limited, Toronto

Linde
Trade-Mark

The terms "Linde," "Heliarc," and "Unionmelt" are registered trade-marks of Union Carbide.

tific knowledge and great financial drive are really amateurs in the political arena. A maverick Californian in the industry undid about all the good the careful, reasoning council of producers accomplished during the campaign for the natural-gas act by spreading money around like a shipload of sailors on pay day.

". . . The Priors, McCollums, Nickersons, and Petersens of the industry thought they had a big story to tell. They worked it up carefully and openly but thereafter it got into the hands of persons far less prepared to spread it. Today the oil leaders probably cry with Churchill, 'Greatly his foes he dreads, but more his friends; He hurts me most who lavishly commends.'"

Editorial in the Tulsa Tribune.

Indiana Standard Not the First

Dear Sir:

We read with great interest in your July 1956 issue *(The Oil and Gas Journal, July 30, page 131)* that Standard Oil Co. (Ind.) is building a new plant at Whiting which will use urea to dewax oils. This plant is said to be the first of its kind.

We should like to point out to you that we are operating a commercial dewaxing plant using urea at the Heide refinery of the Deutsche Erdol-Aktiengesellschaft for more than a year.

We published an article on "The Production of Diesel Fuel and Spindle Oil of Low Pour Points by Means of Urea" in the June 1955 issue of "Erdol und Kohle." . . .

Edeleanu Gesellschat M.B.H.
Frankfurt Am Main, Germany

Trans-Canada Unlimited

"Alberta's gas finding rate of 2 trillion cubic feet per year is over 10 times the Trans-Canada Pipeline Co.'s annual requirements for export to the East. In other words, the gas reserves discovered in the next 3 years would supply Trans-Canada's needs for an additional 30 years.

"According to the most reliable information available at this time, the total requirements for Alberta gas, which includes British Columbia, the Prairies, Eastern Canada, and the presently anticipated United States markets, over the next 25 years will amount to approximately 26 trillion cubic feet. It is estimated that by 1980 Alberta will have remaining recoverable reserves of 62 trillion cubic feet. I wish to point out that only the period up to 1980 has been forecast, and this has by no means exhausted the gas potential of the area under discussion."

A. G. Bailey, chairman of the Gas Policy Committee of the Canadian

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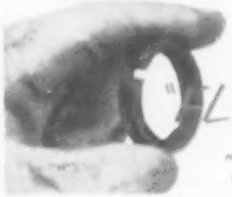

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Petroleum Association, in a speech at the Thirteenth Annual Mines Ministers Conference in Calgary.

CALENDAR OF EVENTS

OCTOBER

1-5 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

3-5 Standards Engineers Society, fifth annual meeting, Hotel Willard, Washington.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

8-10 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

9-10 Southwest Kansas Petroleum Industry and University of Kansas, fourth annual two-day gas measurement institute, Liberal, Kan.

10-12 International Geological Symposium of the Williston Basin, Bismarck, N. D.

11-12 California Natural Gasoline Association, fall meeting, Sheraton Huntington Hotel, Pasadena, Calif.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

14-20 OIL PROGRESS WEEK.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Tex.

22-24 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

23-26 National Association of Corrosion Engineers, south central region, San Antonio.

24-26 Tracerlab Symposium on Applications of Radioactivity, Hotel Statler, Boston.

25-26 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, nineteenth annual meeting, Sheraton Park Hotel, Washington.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-31 Energy Resources Conference, sponsored by the Denver Chamber of Commerce, Denver.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-27 Kansas Independent Oil and Gas Association, nineteenth annual meeting, Broadview Hotel, Wichita.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

3-4 New Mexico Oil and Gas Association, annual meeting, Alvarado Hotel, Albuquerque.

6-8 Interstate Oil Compact Commission, annual meeting, Fontainebleau Hotel, Miami Beach, Fla.

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

11-12 Water Quality Control for Subsurface Injection, conference sponsored by the University of Oklahoma, Norman, Okla.

1957

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Engineers Joint Council, Statler Hotel, New York.

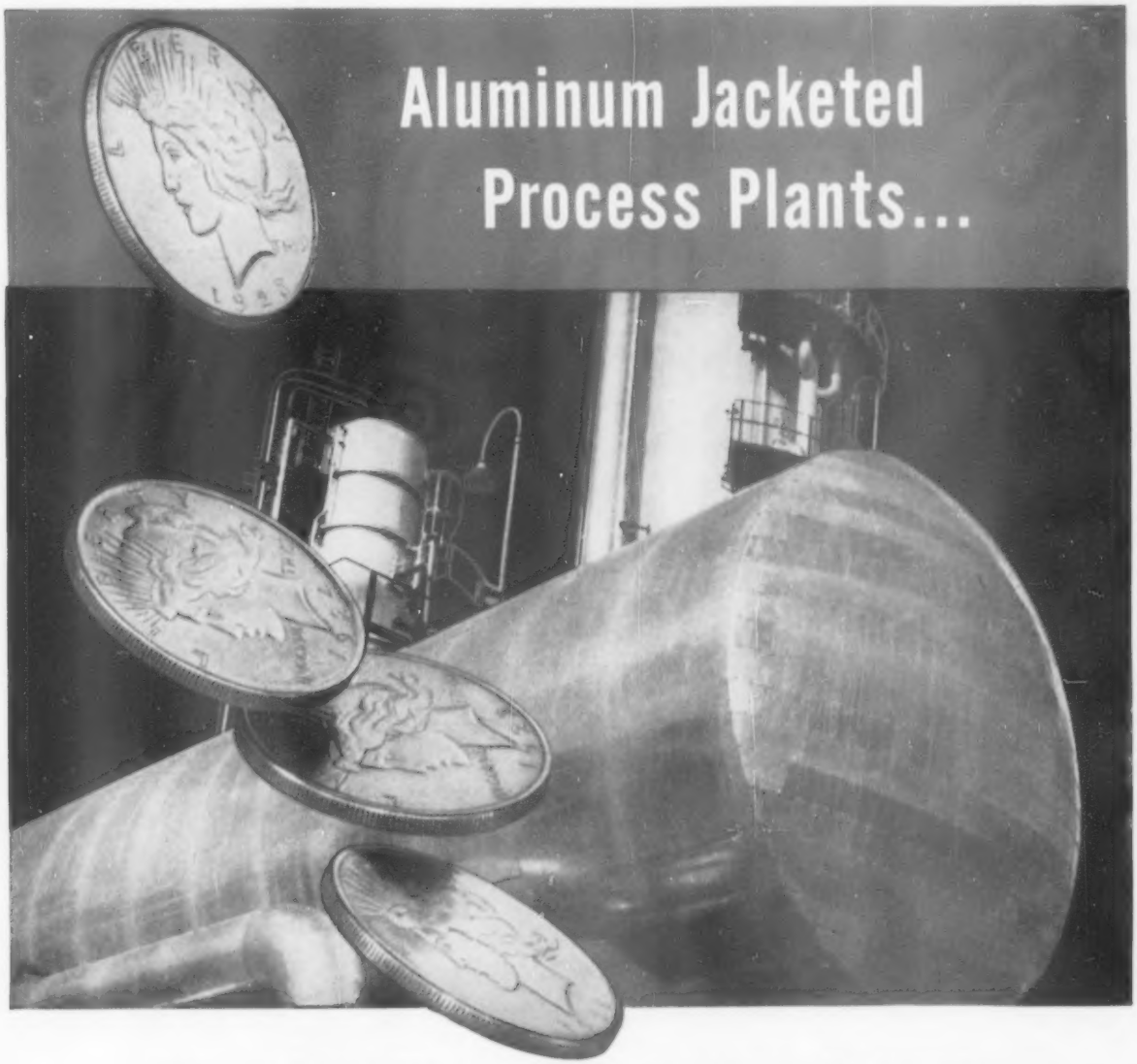
21-25 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

FEBRUARY

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.



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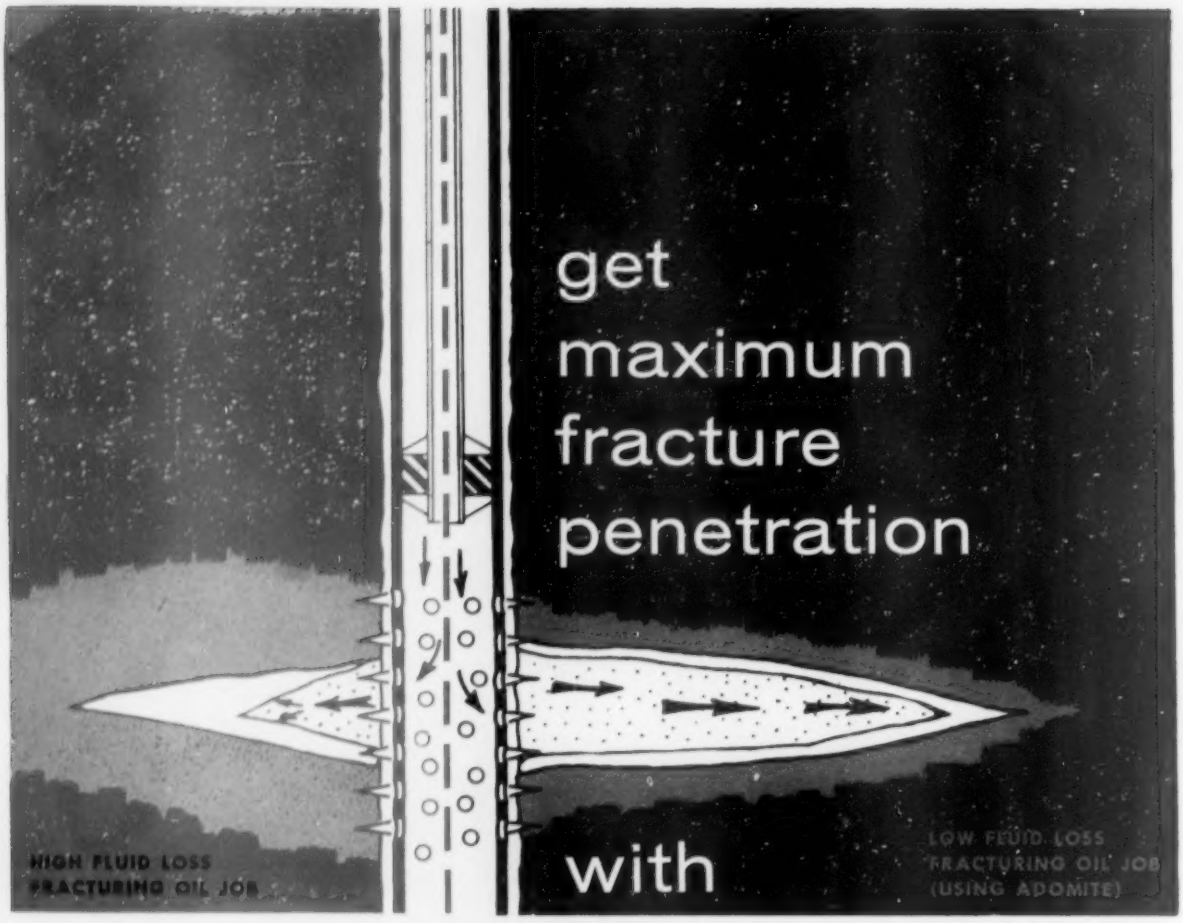

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JOURNALLY SPEAKING . . .

No Bueno

TRAVEL is very educational, and on our vacation trip to Mexico we got some unexpected education on gasoline, altitude, vapor lock, and related subjects.

We learned, first, that Petroleos Mexicanos, for all its progress, hasn't been able to keep up with the octane race. It is starting to introduce a third grade of super-super high-octane gasoline, but this is available only in a very few stations in Mexico City and we were never able to find any of these. What is marketed as "Super" has an octane number of 80, but it is carried only by the larger stations in the larger cities and half the time they are out of it.

However, our old (1954 model) car seemed to run fine on the Super when we could get it and didn't knock too badly on the regular when we couldn't. For the first few days, that is.

Then, all of a sudden, when we were at an altitude of about 8,000 ft. and still climbing, the engine went **phfft**—no pull at all, even with the throttle floorboarded. After a minute she picked up again for a few yards and then **phfft** some more, alternately rock and roll all the way up the mountain at an average speed of about 20 m.p.h.

At the hotel that night another American **turista** explained the phenomenon with a wave of his hand:

"Just that lousy Mexican gasoline. Octane's too low. Can't expect any power out of it on the hills."

But another well-informed traveler had a different explanation.

"The higher you go the less octane you need," he assured us. "Eighty octane's good enough at this elevation. Your trouble is rich mixture. Get your carburetor adjusted for this thin air and you'll be all right."

Next day the car ran fine down hill, but on the first grade it pooped out again. At the edge of the next village we pulled up at a shack where a sign said **"Servicio Mecanico."** In a combination of basic English and complicated gestures we tried to explain our difficulty and need for a carburetor adjustment.

We were positive the **mecanico** hadn't understood a word, for he immediately threw up the hood and attacked the generator with a crowbar. We gesticulated a protest and pointed to the carburetor, but he pointed at the fuel pump tucked under the generator and insisted **"Bomba no es bueno."**

Within minutes he had the inner workings of that pump dismantled and soaking in gasoline (siphoned from our fuel tank). Triumphantly he extracted the diaphragm and announced **"No bueno. Dinero por nuevo."** We handed him money for a new one, and he jumped on a bicycle and disappeared down the road.

We sat on a rock and waited. In about 20 minutes he came pedaling back with a new diaphragm in his pocket, and reassembled the pump with great speed and dexterity. The car ran fine. You can't tell us that Mexicans are poor mechanics or slow workers.

But the next American we talked with took the wind out of our sails. "Your pump was all right," he laughed. "You just had vapor lock. You'll always get vapor lock at high altitudes, and all the automibile engineers in Detroit can't do a thing in the world about it.

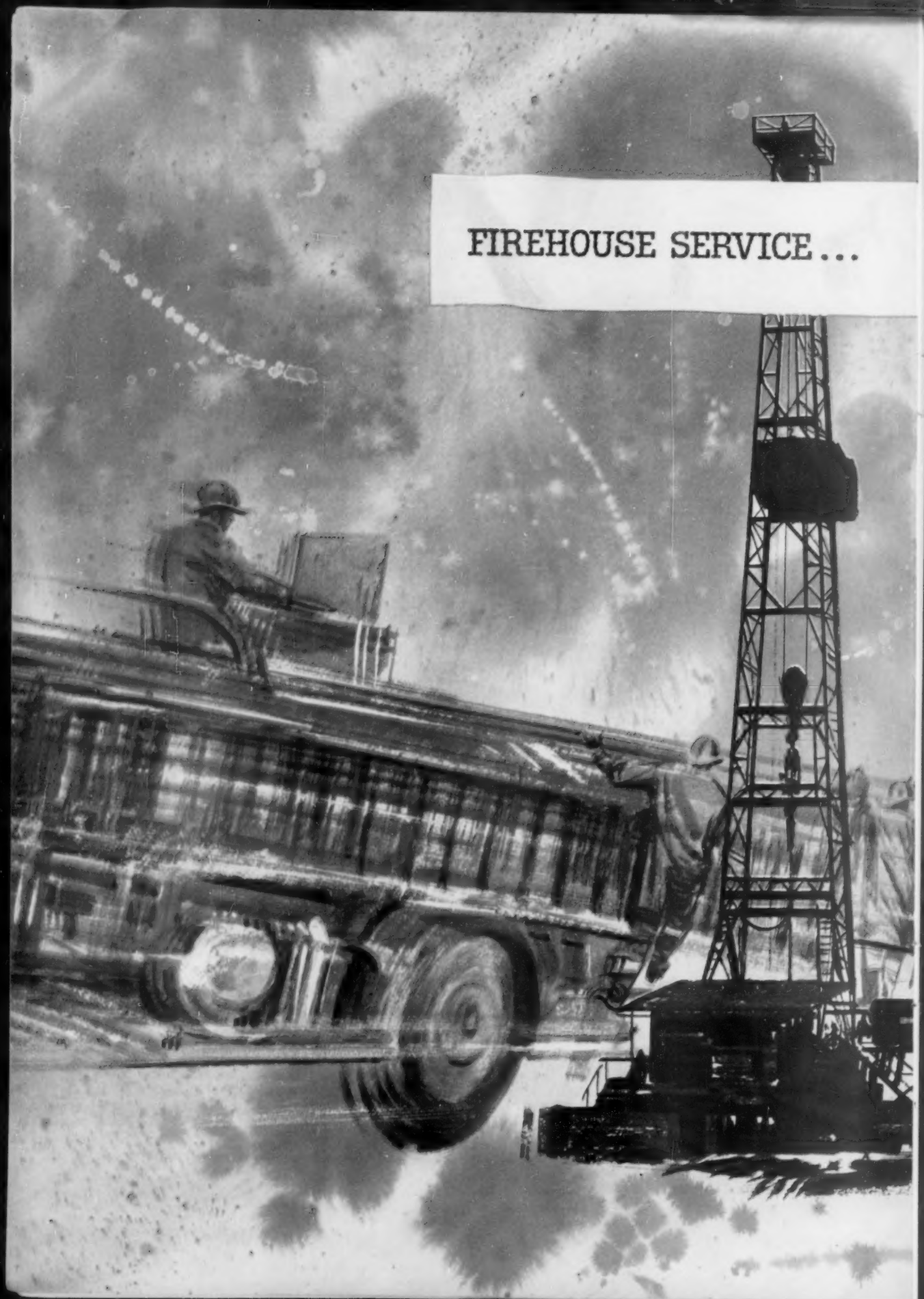
"Tell you what to do. Next time that happens, pack a lot of wet dirt around the fuel line where it runs close to the engine block. That'll keep the gasoline cool and she won't vapor lock."

Sure enough, on the next upgrade the old trouble came back. So we stopped at a mud puddle and coated the fuel line with wet dirt. The car ran fine again, and we congratulated ourself on our new-found technical knowledge. But 20 minutes later—**phfft** again. A fresh application of mud brought no results whatever.

We crept into a city and located a **"Servicio General Motors,"** a big, fine-looking place with white-coated mechanics and a pert **señorita** as a translator. After an afternoon of sight-seeing we returned to be told that the gas tank, fuel line, pump, and carburetor had been full of crud and corruption. No more trouble after that.

We still need some education on the relationship between altitude, octane, and vapor lock (if any) but we are quite sure of one thing: Dirt, either inside or outside the fuel line, is positively **no bueno.**

—*Henry D. Ralph.*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Start thinking on a new gas bill now

IT'S not a bit too early for the industry to start thinking out loud about the natural-gas situation and the predicament caused by the veto of the Harris-Fulbright bill.

Since that veto—last February—the subject has hardly been mentioned above a whisper. There are several explanations for the silence: Possibility of repercussions from the lobbying investigation; desire to keep the issue out of the election; indecision on the best next step.

THESE REASONS NO LONGER PREVAIL. The lobbying investigation, it now seems clear, will not prevent the gas or any other industry from advocating or opposing legislation by proper methods.

Gas legislation has not become involved in the national political campaign, and with the election only 6 weeks away there is little danger that politicians will make an issue of suggestions for future legislation that industry people might make to each other.

As for the frustrating effect of the veto, time is overcoming it and further therapy could come from free discussion.

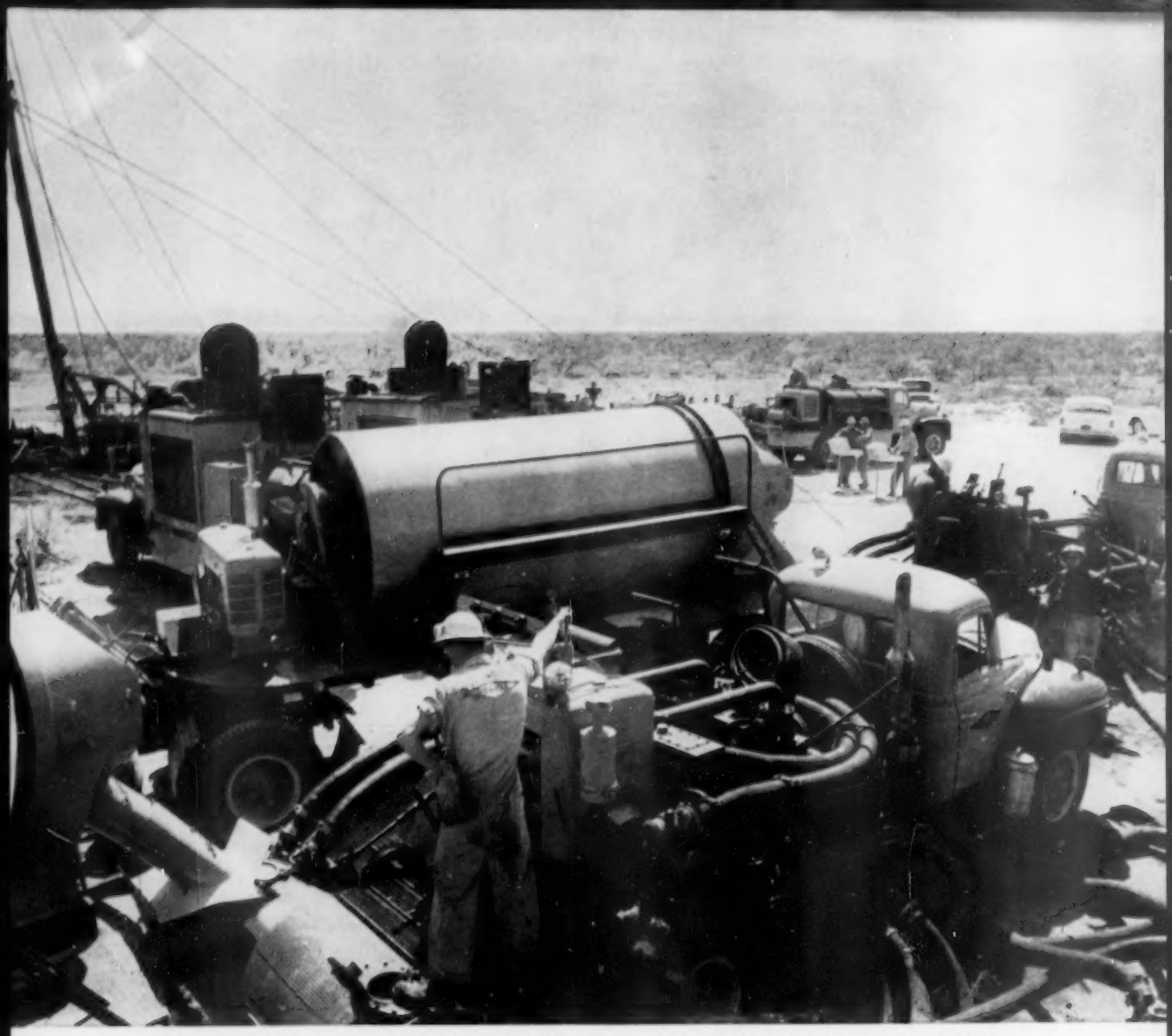
Some ideas are beginning to formulate. A few individuals among gas producers, transporters, and distributors, working purely on their own, have been giving much thought to the problem. They have had some quiet discussions among both their colleagues and their opponents in the late lamented Harris bill hassle.

Most of these individuals have reached conclusions substantially along these lines:

- New legislation is needed soon. The uncertainties involved in trying to remake the pattern of marketing and pricing gas on the awkward framework of the 1938 law are rapidly becoming intolerable to all elements of the industry.
- To stand any chance of passage, the new bill must be reasonably satisfactory to producers, pipelines, and distributors. This means some compromises all around.
- The White House, the Congress, and the public must be convinced that the new bill is in the public interest and is not special-interest legislation.
- To achieve these objectives, all branches of the industry must cooperate in a spirit of live-and-let-live and avoid a repetition of public mudslinging and pressure lobbying.

THAT MAKES SENSE. If more people in the industry will think the problem through and reach the same conclusions, the foundation will be laid for some real progress.

The next step will be the brass tacks of writing a bill. But once the objectives have been agreed upon, free and frank discussion should generate some acceptable legislative language. And it's time to start talking, for a new Congress will convene in 3 months.



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The Industry This Week

General Interest

• **Loss of crude from any closing of Suez Canal** could be easily made up by U. S. industry, figures just coming to light reveal. But closing of both canal and Middle East pipelines would mean a real emergency. P. 52.

Battle for voter support of a conservation act has split the industry in California. Bitterness of campaign raises question: Can anyone win? Result could be loss of valuable goodwill that will take years to rebuild. P. 60.

Oil demand of 13,000,000 bbl. daily in U. S. by 1965 is forecast by Chase Manhattan Bank economist. It's a 50 per cent jump over 1955. P. 68.

Tempo is quickening in Venezuela. Latest developments: A promising new discovery by Sinclair and split of three Lake Maracaibo concessions in million-dollar deals. P. 70.

Production

• **Free world crude production has passed the 15-million barrel** daily mark for the first time. This reflects record output in Middle East and Venezuela. P. 72.

Crude imports into U. S. also topped million barrels daily for first time in July, making it sixth straight month imports have set a record. Odd aspect of Census Bureau report: Exports also showed a jump. P. 67.

Importing companies, however, report to Texas Railroad Commission they plan a 26,500-bbl. daily cut in imports for the rest of the year. P. 64.

Pipelining

• **Effects of steel strike** are still being felt in pipeline industry. Interruption of pipe deliveries has delayed several large projects. P. 54.

Colorado Interstate Gas is revising its proposed big-inch expansion project. Idea is to boost deliveries into Rocky Mountain region as well as bring first Rocky Mountain gas into Midwest. P. 54.

Drilling

• **Offshore drilling in 600-ft. waters is likely** within the next few years, say Shell engineers. Improved techniques and new equipment will make it possible. P. 56.

Dresser has received 40 Russian turbodrills, is expecting shipment of similar tools of French design. Features of both may be incorporated in Dresser-made tool. P. 55.

Accusations of completing wells on unleased submerged land off California were denied last week by companies drilling core holes from floating barges. A legislative subcommittee is looking into the matter. P. 65.

Processing

• **A radical process for preparing cat cracker feed** has been devised by a Chinese engineer. He uses a BF_3-ether reagent to remove coke formers from the crude. P. 59.

New job for a cat reformer has been found at Conoco's Billings refinery. It is used solely to make hydrogen for a Unifining unit to remove sulfur from diesel and heating-oil fractions. P. 59.

World's first continuous processing plant for cresylic acids, cresols, and phenols is going up in New Jersey. Its feed stock will be refinery sludge from plants along the East Coast. P. 55.

First construction contracts have been let on Imperial Oil's $25 million petrochemical complex at Sarnia. P. 68.

Scramble is developing over a new refinery in Turkey. Four majors now seek toehold in country by proposing 60,000-bbl. plant. P. 71.

Suez Closure Wouldn't Mean a Crisis

- **The U. S., alone, could meet Europe's demand; there's plenty of oil—and enough pipeline capacity to the gulf to deliver it to tidewater**

- **But if the Middle East pipelines should close, too, emergency measures would be required to supply all demands. Here's the picture in either case:**

As industry and government leaders probed the Suez problem last week, one thing became obvious.

The U. S. oil industry will have little trouble in filling Europe's needs if the canal should close. But the oil industry definitely would be in a bind if the pipelines also moving crude westward from the Persian Gulf were shut down at the same time.

Assurance of covering any shortages from the canal was slow in coming to light—this in spite of the glib word from state agencies of ability to produce up to 2,250,000 bbl. daily of additional oil.

This existence of producing potential long had been accepted. But the knotty question which had to be answered was: Just how much pipeline capacity is there to move this oil to tidewater?

Last week these figures began to take shape.

A total of 700,000 bbl. daily can be put down at gulf ports through existing lines without emergency organization, according to a study made privately by one major company. It figures these amounts are readily available:

. . . **100,000 bbl.** daily in Louisiana.

. . . **100,000 bbl.** daily in West Texas.

. . . **500,000 bbl.** daily in scattered areas—East Texas, Southwest Texas, and the Gulf Coast.

All interconnections of gathering systems and other required activity could be completed within 3 months, this study shows. Many of the connections would be considered normal practice and would already have been made and crude moving if demand existed for the extra crude.

In an emergency a new pipeline could be built within a year out of West Texas which would add 200,000 bbl. daily more to the total.

Another approach . . . Another survey made by a major operating on the Gulf Coast came up with more conservative figures: 585,000 bbl. daily quickly available at tidewater.

Its figures broke down like this:

. . . **450,000 bbl.** daily out of Texas and New Mexico to the gulf.

. . . **135,000 bbl.** daily from Louisiana to the Gulf Coast.

The company considers its estimates very realistic. It explained they were made after discounting available surplus pipeline capacity in areas where it could not be used.

What's required . . . Either set of estimates provides assurance that enough oil to fill the gap caused by a Suez shutdown can be laid down on the U. S. Gulf Coast.

This shortage currently is being estimated at 475,000 bbl. daily—safely under either the 585,000 or 700,000 bbl. estimates. The estimate is reached by this reasoning:

Volume of oil going through the canal to Europe and the United Kingdom is 1,070,000 bbl. daily with 175,000 bbl. additional to the United States. Assuming the canal is closed and all tankers presently in the trade go around the Cape of Good Hope, the result would be nearly a 40 per cent loss in tonnage because of the added distance.

Translated into oil, this means a loss of about 300,000 bbl. daily in crude movement to Europe. When this is added to the total moving to the United States, it gives the 475,000 bbl. daily shortage which would have to be filled by movement from the Gulf Coast.

Of course by adding more tankers to the Persian Gulf-Europe run around the cape the deficit could be sliced. It might prove more economical, however, to divert the tankers to a Gulf Coast-Europe traffic.

The extra ships needed to carry the oil from the gulf to Europe could be obtained by taking tankers from the U. S. mothball fleet or diverting vessels from other routes into the emergency traffic.

Gulf is the key . . . Ironically, the Southwest is the only U. S. producing region whose excess oil can be thrown into the emergency. And only a portion of this excess is immediately available.

The limiting factor is transportation. Pipelines in many areas have extra capacity, but there is no excess oil near them. Lines in some other regions run the wrong way, or terminate inland. A possible shortage of rail tank cars or tank trucks and high cost of using them limit movement from there to water.

Actually, state officials reported the four southwestern states could step up their production by more than 1,600,000 bbl. daily. Their estimates were:

. . . **Texas**—1,076,988 bbl. daily.

. . . **Louisiana**—332,000 bbl. daily.

. . . **Oklahoma**—118,000 bbl. daily.

. . . **New Mexico**—140,000 bbl. daily.

The attitude of officials in the area was summarized, however, by John B. Hussey, Louisiana conservation commissioner, who flatly said he doubted transportation facilities could move all the oil his state could produce if called on.

"Oil transportation facilities — river barges, tank cars, and pipelines—have not kept pace while oil production and refining have increased," he said. Hussey blamed "excessive" imports for stunting the growth of oil-transportation facilities, adding: "The crisis brought about by the possible shutdown of the Suez, at least to oil shipping, should serve as a warning. Petroleum transportation facilities in this country are not adequate for full-scale national defense efforts."

What about others? . . . The excess oil-producing capacity of other regions, such as Canada and Venezuela, will play only a minor role in the crisis. It would replace some volumes diverted to the gulf or to Europe.

This is the economics bearing on these areas:

. . . **Canada.** Available crude over present production is estimated at about 250,000 bbl. daily, supported by a strong reserve position. The Trans Mountain Pipe Line could deliver up to 139,000 bbl. daily additional crude for use by U. S. West Coast or British Columbia refineries.

This capacity could supply the 117,000 bbl. daily imported at present to West Coast refineries from the Middle East, Far East, and South America. That would allow most of the West Coast imports and tankers needed to move it to be diverted to Europe.

. . . **Venezuela.** Estimates on excess production in this important Western Hemisphere oil country vary from 100,000 bbl. daily immediately available up to 400,000 bbl. daily which would be produced with little extra trouble.

What of a real crisis? . . . A first-class emergency would result if both the canal and the two Middle East pipeline

systems were shut down at the same time.

That would compound the problem by 800,000 bbl. daily—the amount of crude transported through the two lines from Persian Gulf fields to ports on the Eastern Mediterranean.

It would mean:

. . . **The Western Hemisphere** would have to supply Western Europe with 1,275,000 bbl. daily of crude.

. . . **Cost of transporting** crude to tide water in the U. S. would not be such a limiting factor. Many steps considered uneconomic normally could be ordered in such an emergency.

. . . **Rationing of gas** in Europe—and some contend in the U. S., although the latter is a debatable issue.

How to do it . . . With both the canal and Middle East pipelines out, oil planners would face this new set of statistics:

. . . **700,000 bbl.** daily extra available through existing U. S. pipelines at gulf ports.

. . . **575,000 bbl.** daily extra needed. This would be brought in mainly from Venezuela, other Western Hemisphere sources, and by using tank cars, trucks, barges, or newly built or expanded pipelines in the United States.

A second look also could be taken at these other producing areas:

. . . **Canada.** Deliveries on the Interprovincial - Lakehead pipeline system terminating at Sarnia, Ont., could be stepped up by 100,000 to 200,000 bbl. daily. This would partially supply refineries in eastern Canada which now use foreign crude. Movement would have to be by rail, truck, or lake tankers.

. . . **Rockies.** The two major pipelines out of this region to the Kansas City area, with additional pumping capacity, could boost deliveries by 150,000 bbl. daily. However, there is very little unused pipeline capacity out of Kansas City north and east. This means that if Rocky Mountain crude is to be used in the emergency, it must be hauled by rail from Kansas City to the gulf.

There also are a few fields in the Rockies and the Southwest which could produce additional oil. But their present pipeline outlets are operating at capacity.

. . . **Mid-Continent.** With the exception of Oklahoma, most of the additional production available in this region moves away from the gulf. The emergency would have to be sufficient to justify uneconomic use of rail tank cars or truck hauls for Mid-Continent crude to play a role in foreign trade.

Return to wartime . . . Such a crisis would entail an all-out industry effort practically on a basis comparable to World War II conditions.

It would involve shifts in present pipeline movements of crude and also in the use of tank cars and barges on inland waterways.

One authority said this can only be accomplished under a program comparable to that which worked so successfully under PAW during the war period. At present there is a question as to the legality of such committee activities.

Also such a program would involve compensation to those whose operating costs would be increased by use of uneconomic transportation.

What of tank cars? . . . During the war, tank cars cured many bottlenecks in domestic oil movements. But one sobering development has occurred since then: The number of cars available for petroleum service has substantially decreased. Barges for inland water movements likewise are in short supply.

The Association of American Railroads reported on January 1 there were 151,548 tank cars of all types in this country. Of these, 89,844 were assigned to petroleum service, including 17,326 of the pressure type suitable for natural gasoline and liquefied petroleum gas. There were 35,504 in chemical service. In addition Class A railroads have 9,490 tank cars for their own needs, of which 8,645 are in petroleum service.

In 1943, there were 138,451 tank cars privately owned. Of these, 116,000 were in regular petroleum service, considerably more than now available.

Most of the tank cars built in the last 10 years have been for moving natural gasoline and L.P.G. and for cars used in chemical and food services. Very few tank cars of the all-purpose type have been built since the late 1920's.

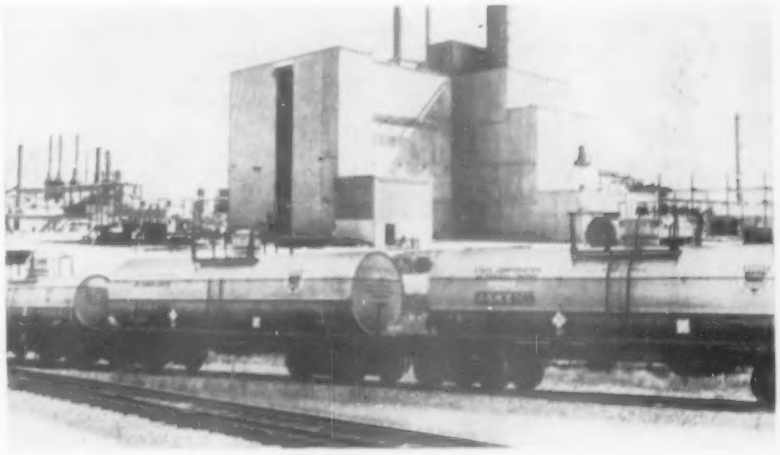
Many tank cars could be made available for crude service if an emergency program were adopted. But the program must allow those familiar with conditions on local and regional levels to coordinate all activities so as to minimize their own tank-car requirements. It means that refiners and buyers must cooperate to the fullest.

Any rationing? . . . The country has the assurance of Mobilization Director Arthur S. Flemming that closing the Suez would not lead to gasoline rationing for U. S. consumers.

He said last week that plans for bypassing the canal do not call for shipment to Europe of any oil needed in this country.

He expressed confidence that this country could produce and move to Europe the oil necessary to meet emergencies arising from loss of the canal or pipelines or both.

Few oil men doubt also but what it can be carried out—but the price of that oil may come high.



Ethyl Plant Is "First" for Canada

SARNIA, Ont.—The first Canadian-made tetraethyl lead began moving to refiners last week as Ethyl Corp. of Canada, Ltd., put its new plant on stream here.

Tank cars of the antiknock compound were moving out of the plant within hours after production started. Ethyl didn't disclose the plant's capacity, but said it is enough to meet current demand and can be expanded.

A feature of the plant is antipollution equipment valued at $500,000. Plant manager is Robert T. Edgar. A formal opening of the new unit is planned for next spring.

Steel Strike Still Felt

Interruption in deliveries of pipe has delayed several big pipeline projects—but dislocations not too serious

THE pipeline industry last week was still feeling the effects of the steel strike—and will for a while.

Interruptions in pipe deliveries have delayed several large pipeline projects. But the disturbance in most cases is not serious.

It is generally expected that pipe deliveries scheduled for 1956 before the strike will largely be made before the end of the year. While pipelines are penalized by delays and higher steel prices, their programs are not drastically harmed in most cases.

The current pipe-delivery situation is somewhat mixed. Here's the picture:

. . . **El Paso Natural Gas Co.** received some 34-in. and some 20-in. before the strike for two sizable projects. Since the strike there has been some delay in resuming deliveries as well as some uncertainty over when the balance will be received. These problems are not expected to be serious.

The two projects are the 193-mile, 34-in. San Juan basin to Topock, Ariz., line and the San Juan basin to Phoenix line.

. . . **Colorado Interstate Gas Co.** was delayed in starting its Laramie-Green River, Wyo., 238-mile, 22-in. line.

Deliveries from strikebound Consolidated Western Steel Corp. were cut off in July and work could not be resumed until pipe began to come in August from strike-free Kaiser Steel Corp.

These deliveries started after Kaiser completed shipments to Pacific Northwest Pipeline Corp., which obtained a major part of its 1956 requirements from Kaiser.

. . . **American Louisiana** Pipe Line Co. felt no adverse effects from the strike.

The 1,160-mile line from North Tepatate, La., to Detroit was finished with pipe delivered before the strike and put in operation August 15. It was built in 251 actual working days.

Its Defiance, Ohio-Bridgmen, Mich., 121-mile, 22-in. line is being built as planned. Not a day was lost. Substantial pipe deliveries started before the strike and the remainder of the pipe has been shipped since then.

Early last week about 27 miles of 22-in. had been laid by both spreads.

. . . **Tennessee Gas** Transmission Co. will complete its 1956 pipeline-construction program in October with loops laid in the Appalachian area.

Before the strike T.G.T. had received all of the 355 miles of pipe for the "Muskrat" project in South Louisiana. By the time the strike began, T.G.T. had receieved approximately 40 miles of 30-in. pipe as part of its needs for additional looping in Ohio and Pennsylvania—loops authorized by the Federal Power Commission on June 28.

A week after the strike ended the mills resumed rolling and have delivered all of this pipe to the company. Altogether, T.G.T. suffered only a 5-week interruption in deliveries.

. . . **Transcontinental** Gas Pipe Line Corp. is under way on an abbreviated looping program. It is making the most of a supply of pipe which is limited because of the lateness of prospective deliveries in 1956.

Transco revamped plans so that 1956 loops will be shorter than originally anticipated. With these loops the 1956-57 contracted winter gas-delivery requirements will be met. Transco will extend them next year to the full length.

. . . **Trans-Canada** Pipe Lines, Ltd., has been harder hit by the strike than any other company.

After delivery of the 125 miles of 34-in. pipe that had been stockpiled before construction started in July, there was a lag until the July quotas of pipe began moving to the Saskatchewan job late in September.

Pipeliners and mill operators agree that the pattern of pipe delivery this year is pretty much the same as that following the steel strike of 1952.

The 1952 strike lasted 6 weeks. By the end of the year practically all of the line pipe scheduled for the year had been delivered, although shipments ran late in the season.

This year the strike lasted only 4 weeks. So far, shipments of July quotas from the mills have been between 30 and 60 days late.

The long-term future is something else. Because of the increase in pipe orders in recent months, it is difficult now to arrange for pipe delivery for a major project before 1959.

Canadian Pipeline Contracted

VANCOUVER. — Dutton - Williams Brothers, Ltd., of Calgary has been awarded a $9,000,000 contract for general construction on a new distribution system of Inland Natural Gas Co., Ltd., in the rugged and mountainous interior of British Columbia.

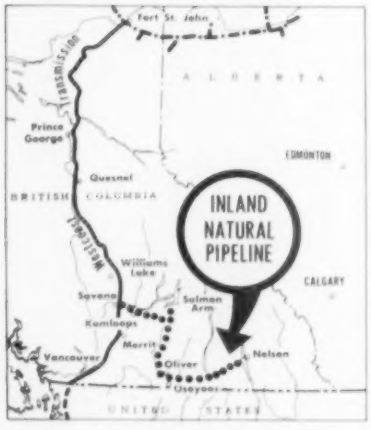
The project involves some 360 miles of trunk lines running from Savona east through Kamloops, down the Okanagan Valley to Oliver, and east to Nelson. Some 50 miles east of Kamloops, a spur will swing up to Salmon Arm. Another will extend from Oliver south to Osoyoos.

The line will supply gas to some 25 communities along the route. Inland will draw its gas from the big Peace River-Washington line now being built by Westcoast Transmission Co., Ltd.

Pipe has been ordered from Canadian Western Pipe Mills at Port Moody, B. C., and Alberta Phoenix Mills at Edmonton. The orders, involving $6,500,000, are for 12, 10, 8, 6, and 4-in. pipe.

Surveys of most of the project have been completed and clearing and grading are scheduled to start October 15. Stringing of pipe will start next spring.

Major system planned . . . The project is part of a major distribution system planned by Inland Natural Gas, which has received authorization from the British Columbia Public Utilities Commission to transmit and distribute gas through large areas of the province. It is also authorized to sell gas to the Prince George Gas Co.



Inland President John A. McMahon said the company will spend some $22,000,000 during the next 12 months and a total of $28,000,000 by 1960 to provide distribution facilities.

Inland's plans include lateral transmission lines from Westcoast facilities to serve the areas of Prince George, Quesnel, Williams Lake, and Merrit.

Ford, Bacon & Davis Canada, Ltd., is project manager for construction. The entire system is scheduled for completion in the summer of 1957.

New Plant Will Process Refinery Sludge

NEWARK, N. J.—The world's first continuous processing plant for cresylic acids, cresols, and phenols is nearing completion on a 48-acre site near here.

The refinery will use a feed stock of spent caustic wash or cresylic acid sludge from a number of oil refineries throughout the eastern seaboard. It will be operated by Pitt-Consol Chemical Co., a subsidiary of Pittsburgh Consolidation Coal Co.

The $3.5-million plant will begin operations late this year and will triple Pitt-Consol's production of cresols, cresylic acids, phenol, phenolic resins, and molding powders. The new process will produce higher purity products than was possible by the old batch-processing methods.

The continuous extraction process was developed during years of research in coal-chemicals refining at the parent company's Library, Pa., laboratory. A larger refinery producing the same range of chemicals from liquids derived from low-temperature carbonization of coal is planned for operation at Cresap, W. Va., by late 1958. Combined output of the two plants will total about 60 million pounds of the chemicals a year.

Flossie Tough on Offshore Oil

NEW ORLEANS.—Offshore oil operators counted their losses in millions of dollars last week as a result of the worst storm they have weathered in the Gulf of Mexico.

Reports of damage to platforms, vessels, and coastal installations were still coming in late last week as communication was reestablished in some of the outlying areas. Although combined loss was great, most of the damage to individual companies was believed to be relatively minor.

Winds were reported at 95 to 103 m.p.h. in some areas as hurricane Flossie raged across the coastal area south of New Orleans. It was the most severe storm to hit the area since the tidelands were reopened to drilling 3 years ago.

Operations resumed . . . Most of the offshore installations and equipment withstood their first major hurricane without great damage. Many of the drilling structures were abandoned as the storm approached. Most were back in service within 2 days.

Two tenders owned by the C.A.T.C. group broke from their anchors during the peak of the storm September 24. With skeleton crews aboard, they drifted south about 15 to 20 miles before being taken into tow the following day. They were returned to their base for inspection and possible repairs.

A helicopter on an inspection tour for Rimrock Tidelands, Inc., developed engine trouble and landed in the gulf south of Morgan City, La. A tool pusher, Leland Bundy, and pilot, George Sampson, clung to pontoons over night as they drifted about 20 miles south of the spot where the helicopter went down. They were rescued the next morning by a tanker.

Kerr-McGee Oil Industries, Inc., reported one of its submersible barges was moved about 5 ft. off location and another settled several feet into the mud. Both barges were in the Timbalier area, and one had 14 men aboard.

The company also reported that one man suffered a leg fracture and two crew boats had very minor damage as a result of the storm.

Another submersible barge, owned by Morris & Hamilton, Inc., slipped from location off the Louisiana coast. No major damage was reported.

Inland areas hit . . . Inland production facilities were severely damaged in some areas.

Richardson & Bass feared it may have lost one sidetracked hole drilled under the Mississippi River in the Pointe a la Hache area southeast of New Orleans.

Storage tanks ranging from 10,000 to 30,000 bbl. in capacity were floated off their foundations in that area, and warehouses, vehicles, boats, and living quarters were heavily damaged. Richardson & Bass estimated its production loss in the Pointe a la Hache district would amount to about 40,000 bbl. of oil.

Dresser Buys Drills

Russian turbodrills reach Dallas; French make on way

DALLAS.—Persistence has paid off for Dresser Industries, Inc. The firm has received 40 Russian turbodrills and is expecting a shipment of similar tools of French design.

The company said it will test and evaluate the high-speed drills, rated at 900 to 1,200 r.p.m., and incorporate some of their features into an improved Dresser-made turbodrill. Dresser is conducting extensive tests here and at its Manchester, England, plant on a new type rock bit to work at these high speeds.

Dresser's French deal is with Etablissements Neyrpic of Paris *(The Oil and Gas Journal, June 18, page 134)*. It was made after the U. S. Commerce Department blocked the first attempt of the company to obtain the Russian design *(The Oil and Gas Journal, May 21, page 139)*.

Dresser had offered technical data to the Russians in return for the turbodrills, but the Commerce Department ruled the information was not for release. This time, Dresser made a straight cash deal with the Russians. The French company will get royalty payments for turbodrills of its design sold by Dresser.

Drilling in Water 600 Ft. Deep Forecast

● Shell engineers outline some advances in offshore-rig designs, say deep-water drilling barrier will be cracked by floating barges like those used off California

DALLAS. — Offshore oil explorers, armed with improved techniques and equipment, likely will be drilling in waters 600 ft. deep or more within the next few years.

This is roughly six times the maximum water depth at which present mobile drilling units are able to work.

Such a development would mean that vast submerged areas, not even considered for exploration now, soon will be opened to the drill.

This picture of what is to come offshore was painted last week by two Shell Oil Co. engineers for the Petroleum Mechanical Engineering Conference held here by the American Society of Mechanical Engineers.

The Shell men were R. J. Howe and B. G. Collipp, of the technical services division of Shell's exploration and production department at Houston.

They see a big future for the floating type of drilling platform now being pioneered on the West Coast by Standard Oil Co. of California, Richfield Oil Corp., Western Gulf Oil Co., and the C.U.S.S. Group (Continental, Union, Shell, and Superior).

It is this type of unit which Shell expects to be drilling in 600 ft. of water in the next few years.

There already are five of them on the West Coast. California Standard has one, Richfield one, the C.U.S.S. Group two, and Western Gulf one. General Petroleum Corp. and Humble Oil & Refining Co. are now equipping similar units.

Howe and Collipp admit that use of the floating platform in the Gulf of Mexico is restricted at present because oceanographic conditions there are more severe. These obstacles, though, are almost certain to be overcome.

Another key problem barring wide-scale use of the floating platform now is the lack of a technique for completing wells underwater. The Shell men point out, however, that oil companies and manufacturers are working hard here, too. A workable solution, which is predicted in the near future, will add impetus to mobile drilling activity of all types.

Mobile drilling units other than floating platforms also will be drilling in much deeper waters in the next few years. The Shell engineers estimate that conventional mobile units and fixed platforms will be operating in waters as deep as 250 ft.

Mobile units multiplying . . . Most offshore wells still are drilled from fixed platforms, but the number of mobile units in operation is growing fast.

At the end of 1955, there were about 13. This year the number will about double to 25 or 26. They cost from $2,000,000 to $7,000,000 apiece, and total outlay so far probably exceeds $75,000,000.

Mobile unit designs at present differ drastically even for units used in the same locality and same water depth. The design variations, the Shell engineers say, are due largely to the lack of reliable information on the size of forces which hurricane winds and waves exert on a fixed object standing in a body of water.

Only a hurricane in the operating area, they feel, will adequately test which of the many designs is best suited to withstand such conditions. Since weather experts advise that offshore operators must expect five severe hurricanes in the next 100 years, the Shell engineers feel that it would be best for one to occur soon. Otherwise, in the long run, millions of additional dollars will be wasted on over or under design.

The authors cut through the design confusion by classifying present mobile units by:

. . . Amount of equipment, whether they are self-contained or served by a drilling tender.

. . . Method of installation, whether fixed deck, elevating deck, elevated deck, or floating-type units.

. . . Method of support. The four possibilities are: Piling support, hull support, piling plus hull support, and anchor support.

Current design trends . . . The Shell engineers note an increasing trend this year to repeating certain mobile-unit designs after 5 years of wide variation in both over-all design and water-depth capabilities.

One reason for this, they feel, is that the number of units is growing so fast that technical manpower is not available to prepare and evaluate very many new designs. Secondly, 5 years of experience has provided enough data to make it more practical to modify existing units rather than devise radical new ones.

Construction of new additions to the mobile offshore fleet indicate that operators are turning to:

. . . Open fabricated legs built of circular members from the old piling-type leg. The change is for two reasons. First the open leg can be built larger in diameter to increase bending resistance without greatly increasing the force of wave action against it. This isn't so in the case of the circular pile.

Further, with those units using jacks to elevate the platform, it is much more difficult to transmit loads approaching 1,000 tons from the platform to the smooth circular pile.

. . . Shaped hulls. Those units having submerged bearing hulls are employing hulls more streamlined so as to reduce wave forces and scouring action. Though as much as 50 or 75 ft. below the surface, the hulls must contend with forces accounting for up to 80 per cent of total wave forces on the entire unit.

. . . Multiple-well and adjustable derricks. This trend has resulted due principally to the high costs of erecting production platforms in deep water and of moving a large mobile unit even a short distance. Shell calculates that in deep water a platform designed to accommodate five wells usually will not even double the cost of one built to handle only one.

An important feature of some recent unit designs is the adjustable crown block and rotary table, which can be moved several feet in two directions. With this equipment, tools can be lined up with the hole without tediously moving the entire platform.

. . . Vertical stabilizing columns for fixed-deck mobile units to cut costs of construction and possibility of equipment failure by eliminating many moving parts. These columns, placed far apart in order to hold down their size, are used instead of pivot pontoons, footpads, side pontoons, or dumbbell-shaped hulls.

. . . Larger drilling slots so that wellhead jackets can be installed more easily.

. . . Winches, piledrivers, and drilling masts which can be tilted for hoisting. All of these now are being used as regular platform equipment to speed up and cut costs of positioning the unit, handling and driving the jacket.

and performing other drilling preliminaries.

What to look for . . . The Shell engineers predict that conventional mobile-unit designs during the next 5 years will tend to become much more standardized but will differ according to water depth.

They feel that the fixed-deck type likely will predominate in waters up to 70 ft. deep. The fixed-deck unit has proved satisfactory for such drilling and is less expensive.

All mobile units now used for drilling in waters deeper than 70 ft. employ exceedingly expensive jacking devices to drive piling or elevate the drilling deck. Such devices make operation of these units costly.

The Shell engineers refuse to predict what effect drilling from floating vessels will have on the cumbersome jack-type platforms but appear to hint that the latter might not be able to compete.

They feel, too, that the present marsh-type barge rig may be the ancestor of a new type unit which will be used cheaply and efficiently in shallow waters offshore. Many already have operated close in to shore at rates well below those incurred with deeper-water units.

There is room, Shell feels, for a new design which can operate as cheaply as the marsh rig and last out heavy weather like the bigger platform types.

The cost of present-day mobile drilling units is heavy—averaging around $40,000 per foot of water-depth potential. The Shell engineers predict, however, that unit cost will go down considerably as designs are standardized and more operating experience becomes available.

Jersey Moves West Again

NEW YORK.—Standard Oil Co. (N.J.) has made a second move into the Midwest market. It is buying out two independents with a total of 118 dealer outlets in the Chicago area.

A stock-exchange deal will give Jersey Standard all outstanding shares in South Side Petroleum Co. and Perfect Power Corp.

South Side owns 33 service stations and has leases for 33 more. It has five dealer-operated stations. The company had a total income of $22,803,556, with a net of $642,166, for the year ended April 30. Perfect Power last year had a total income of $3,720,515 and a net of $63,135. The company owns 31 stations and leases on 16.

Jersey Standard gained a toehold in in the Midwest market last June through the purchase of Pate Oil Co., which operated 140 service stations in the Milwaukee area.

watching WASHINGTON

. . . with Bertram F. Linz

Government quits a winner . . .

THE rubber disposal commission went out of business last month. As a result of its 3 years of work the U. S. has a highly successful, expanding and privately owned synthetic rubber industry. And the Government has a neat $26,000,000 profit on its own venture in that field.

The commission was set up in 1953 to sell the Government's 27 rubber plants. It disposed of 26 of them for nearly $285,000,000 and leased the other one.

The leased plant is the big alcohol-butadiene producer at Louisville, Ky. A high-cost operation, it was the first plant to be closed when the emergency need ended. The commission made two tries at selling it. The first try brought no bids. On the second round, the commission made a deal with Union Carbide & Carbon Corp. for $3,125,000, but Congress wouldn't go for it.

The plant is under lease to Publicker Industries, Inc., until April 1958. It has been turned over to the Federal Facilities Corp., which will make another try at selling it. Bids will be received until October 1. If it can't get rid of it, the Government probably will continue to lease it, if it can.

The only wartime facilities sold by the Government at a profit were the rubber plants and the Big Inch pipelines.

The industry with the fringe on top . . .

REFINERY workers get more in the way of fringe benefits than employes in any other manufacturing industry.

The U. S. Chamber of Commerce recently surveyed 1,000 companies in the major industries, 19 of them oil companies. It found that pensions, vacations, social security, and other benefits last year averaged $801 per employe for all manufacturing. But in the refining industry they amounted to $1,278 per employe.

The fringe benefits paid by refiners figured out to 61 cents per payroll hour against 37.7 cents for all manufacturing. They represented 24.3 per cent of refining's payroll, against the national average of 18.5 per cent.

Here is how refining industry benefits for each employe broke down, in terms of dollars per year: Employer's share of legally required payments for social security and unemployment and workmen's compensation, $147; employer's share of pension plans, life and health insurance, hospitalization, severance allowances, free meals, etc., $521; paid rest, lunch periods, and other time allowances, $21; vacations, holidays, sick leave, and National Guard and jury duty, $436; profit-sharing payments, bonuses, etc., $153.

Workers' contributions, primarily for social security, pension plans, and insurance and hospitalization, amounted to $279. They represented 5.3 per cent of payroll and worked out to 13.3 cents per payroll hour. The average for all manufacturing was $142, 3.3 per cent of payroll, and 6.7 cents per payroll hour.

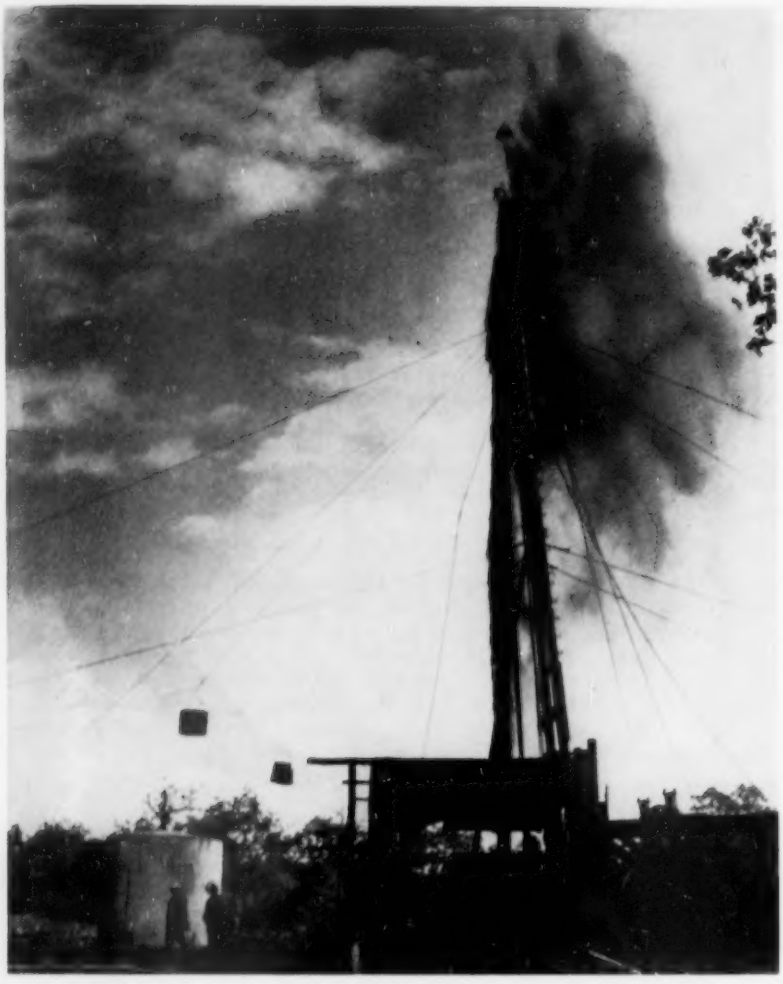
Flemming hands steel write-offs to cabinet . . .

FINAL decision on a new expansion program for oil-country tubular goods and steel plate has been put up to President Eisenhower's cabinet.

The matter was referred to the cabinet by Mobilization Director Arthur S. Flemming as applications for quick write-off of new steel producing plants hit the $1,300,000,000 mark.

Flemming has had the new expansion program under study for some weeks, but reached no decision. Some cabinet members have voiced opposition to the write-offs. Treasury Secretary George Humphrey for one has been reported against any expansion programs not directly tied in to national defense.

The shift of responsibility brought biting criticism from steel industry leaders. It is a "stall," they say, that will table the matter indefinitely.



Drill Taps an Oklahoma Gusher

TULSA.—A new look at an old area a few miles west of here apparently has paid off. Oklahoma independents John T. Harris, Harold G. Kramer, and others tapped a gusher September 23 in the little-tested Burgess sand at 2,050 ft.

The well, 1 Harris, flowed through 7-in. casing. Oil shot 100 ft. into the air and covered some 40 acres before the well was brought under control about 1½ hours later. Penetration was 2 ft. into the pay zone.

Bill Hale, of Independent Drilling Co. of Tulsa, a minority owner, placed the flow at about 300 bbl. of crude daily and a million cubic feet of gas.

Using a cable-tool rig, Independent drilled the well in 17 days. Operators last week were preparing to run 5½-in. casing.

The well is an 800-ft. offset to the only other Burgess well in the area. C. E. Beal of Tulsa drilled the first one, an extension of the Page district, 2 years ago. It was completed on pump at 12 bbl. daily and is now pumping 7½ bbl. daily.

The 1 Harris is on a lease owned by Kramer & Harris. Surface is owned by Sand Springs Home Interests, now preparing to drill an offset, and mineral rights are held by the Osage Indians.

Oklahoma Cuts Allowable

OKLAHOMA CITY. — Oklahoma has trimmed nearly 20 per cent off its crude production in setting the state's allowable for October. The new allowable is estimated at 560,000 bbl., down 42,000 bbl. from the September total of 602,000 bbl. Allocated pools will be allowed to produce 252,000 bbl. and unallocated pools, about 308,000.

Oklahoma Corporation Commission also extended through October its order forbidding purchasers from cutting their takes below amounts fixed by the commission.

New Tool Licensed

Gulf's new lost-circulation detector is made available

PITTSBURGH. — Gulf Research & Development Co.'s new lost-circulation detector has been licensed to service companies and is now available to the industry.

The tool holds promise of faster detection of trouble spots in drilling wells where loss of drilling mud is a major problem.

The device is actually a flow-rate detector sensitive enough to pinpoint within 6 in. a zone of mud loss.

When circulation is lost, the tool is lowered on a wire line. Mud is pumped down the hole and the movement is detected by the tool as it traverses the hole. At the point of mud loss, however, the mud flows out of the bore hole and below this point little or no movement occurs. The tool accurately determines this zone by the change in flow rate.

There are three advantages over existing lost-circulation detectors:

... It can bracket the loss zone with a flow of as little as half a barrel of mud per minute.

... Accurate location of the zone makes it possible to spot zone-sealing materials more successfully.

... Design of the tool is such that it is difficult to plug.

The device is a hollow cylinder open at both ends. The lower end is slightly constricted so that as mud flows through the tube it creates a slight pressure, forcing part of the mud out a side window covered by a flexible membrane.

An electrode attached to the membrane detects the movement and sends a signal to the surface.

Imports Ruling May Be Near

WASHINGTON.—The Cabinet fuels committee may reach a decision this week on whether the present imports formula should be changed or kept as it is.

The committee received a report September 21 from its task force set up to study the formula, but it reached no decision. It will meet again October 2 to receive a staff paper being prepared by the Office of Defense Mobilization.

Officials said the committee might reach a decision at this meeting. It is possible, though, that further study will be indicated and a third meeting called.

New Crude Process Bared

Chinese researcher uses BF_3-ether reagent to remove coke formers but conserve heavy oil in cat cracker feed stock

CASPER, Wyo.—A radical new method of cat cracker feed preparation was revealed here last week. It uses a BF_3-ether reagent to remove "coke formers" from the crude.

The development, covered by U. S. Patent 2745792, was outlined by its originator, C. D. Shiah of the Chinese Petroleum Corp., Taiwan, for members of the Western Petroleum Refining Association.

Shiah explained his method intended to remove as much of the "coke formers" as possible from a crude or reduced crude while keeping loss of useful heavy oil to a minimum. He declared the process also may offer these economic advantages:

. . . **Cost is comparable** or lower than vacuum flashing.

. . . **Gross returns** in additional products is about 20 per cent more.

. . . **Application** also can be made on other stocks, such as heavy recycle oil or No. 2 fuel oil.

The process . . . Shiah's method actually is simple.

Crude oil is mixed with 2.5 per cent by volume of BF_3-ether compound at normal temperatures and pressures. It is centrifuged or allowed to settle. The asphaltenes or coke formers will settle out with the bulk of the BF_3-ether as a heavier tar layer.

Bulk of the oil, containing traces of BF_3-ether reagent, is fractionally distilled. Metal contamination is reduced in the order of 50 per cent; sulfur and Conradson carbon by about 30 per cent. Topped crude from the distillation system is then charged directly to the catalytic cracker.

The heavier layer of tar and BF_3-ether compound is diluted with a light naphtha, and then heated and distilled. The BF_3-ether is carried over by the light naphtha and condensed as a lower layer covered by a light naphtha layer. The light naphtha is recycled and the reagent reused.

Reaction of BF_3-ether with sulfur compounds is nonselective. By treating crude oil, instead of reduced crude, sulfur content of the lighter fractions is simultaneously reduced. These lighter fractions then serve as diluent for ease of handling the bulk of the oil. The topped or reduced crude from the distillation system goes to the cat cracker directly. The cycle oil is hydrofined by the hydrogen-rich cracking gases.

Chief advantage . . . Shiah stated the process has one big edge over vacuum distillation or propane deasphalting.

Distillation or propane deasphalting remove the undesirable constituents, Shiah declared. But they also remove a large portion of desirable constituents. This decreases the yields of gasoline. Shiah's process removes less than 10 per cent bottoms from an ordinary crude oil.

Shiah reported the process was used in the laboratory on Arabian (Kuwait and Wafra) crude oils and several Texas sweet and sour reduced crudes. In all cases the tar removed from the oil by the BF_3-ether reagent had a Conradson carbon residue of more than 60 per cent. Thus practically no useful oil was taken out of the system, he concluded.

After light straightrun is taken off in Shiah's method, the remaining treated oil is comparable with vacuum gas oil or propane-deasphalted oil except for higher carbon and metallic content. Shiah admitted the treated oil at this stage still contains large quantities of coke formers but a greater removal would sacrifice useful oil. He declared the larger regenerator capacity then required to burn off the extra carbon will be economically justified in view of the increased gasoline yields.

How much metals? . . . The metals content will remain higher after treating with BF_3-ether reagent, but is not intolerable.

Shiah contended that oil with total metals content of 15 p.p.m. can be cracked using natural catalyst at a makeup rate of 1.5 lb. per bbl. or roughly twice that used by some refiners in present practice.

Shiah figured that if an 18° A.P.I. reduced crude, treated by his method, is charged to the cat cracker, the equilibrium metals concentration would be 3,310 p.p.m.

He estimated a 2 per cent decrease in gasoline yield, a 2 per cent increase in carbon yield, and an increase in hydrogen yield of 275 cu. ft. per bbl. of feed. With today's emphasis on Hydrofining, this extra hydrogen could be extremely useful. Also since very little useful material is removed in treating, there should be an over-all increase in gasoline yield of about 20 per cent compared to yields obtained through vacuum distillation or propane deasphalting.

Cat Reformer Handed Odd Job

Conoco uses reforming facilities at Billings for making hydrogen needed to remove sulfur in heavier fractions

CASPER, Wyo.—Continental Oil Co. is giving the catalytic reforming facilities at its Billings, Mont., refinery an unusual job.

A single-case reforming unit is being used solely to produce hydrogen. This is then employed in a new Unifining unit to remove sulfur in diesel and heating-oil fractions.

Conoco's L. E. Adee said catalytic reforming for octane is not necessary at this time in the Billings area. Heavy black Wyoming crudes yield a relatively low percentage of straight-run gasoline. With high yields of cat-cracked gasoline, there is no octane pinch.

But these same Wyoming crudes pose a problem with regards to sulfur.

Unifining . . . Conoco has an Esso Research & Engineering Co. fluid desulfurizer at the Billings plant.

It gave good sulfur removal in the gasoline range but removed only half the sulfur in the diesel fraction. Conoco then decided to convert Unifining.

"Since reforming for octane was not necessary," Adee said, "our reformer was designed to be a hydrogen factory with provisions for later expansion to a conventional type of reformer. In order to protect the reforming catalyst, the naphtha is charged to the desulfurizer with the rest of the crude tower overhead," Adee said. He was speaking at the W.P.R.A. meeting here.

Continental operates the single-case reforming unit at maximum charge rate at the lowest temperature to make the amount of hydrogen necessary for Unifining. The reformer is started with naphtha from storage. The desulfurizer then goes on and the reformer is switched to direct feed which is Unifined naphtha. This feed should contain no catalyst poisons. The lowest possible operating temperatures should give maximum catalyst life.

After 4 months of operation at Billings, the reformer had passed the 100-bbl. per pound of catalyst age without apparent decline in catalyst activity. It was hoped that 300 bbl. per pound could be reached before regeneration.

"ANTI" CARTOON appeared in the Avenal Times

"PRO" CARTOON was published by the San Juan Record

Bitter battle raises the question . . .

. . Can Anyone Win in California?

LOS ANGELES.—California's oil industry is tragically split by a bitter election battle over an oil and gas conservation act.

The name-calling has reached a state that neither side really may win. The upshot could be:

. . . **The loss of valuable goodwill** that took the industry years to build.

. . . **Taint in the public eye** that will take more years to remove.

The bizarre aspect of the whole campaign is the vast sums being spent by the industry to tear itself apart. Never in California political history has the state seen such spending for and against a ballot proposition.

Some estimate the total bill will run close to $5 million.

Charles S. Jones, president of Richfield Oil Corp., one of the sponsors and originator of the referendum proposal, said $2 million alone was spent in the preliminary educational work on the measure. He gave his figures to a state assembly subcommittee. Naturally, the big spending has come since in elaborate billboard, newspaper, radio, and television advertising, big publicity campaigns, and the like. It likely will continue unabated right up to the November 6 election.

Who's fighting . . . The "for" and "against" lineup of oil companies has been pretty well established.

Advocates for the compulsory conservation plan include Richfield, Shell Oil Co., Tidewater Oil Co., The Texas Co., Standard Oil Co. of California, General Petroleum Corp., Ohio Oil Co., and Continental Oil Co. plus some independents and individual operators.

Opposed are Union Oil Co. of California, which has carried the brunt of the fight against the bill so far, Universal Consolidated Oil Co., Signal Oil & Gas Co., Hancock Oil Co., Monterey Oil Co., as well as a reported majority of the independents.

Old tactics used . . . One thing about the bloody battle within the industry: It didn't deteriorate into a name-calling contest. It started out that way from the opening shot.

The nicest things opponents have called each other so far are monopolists and spoilers. Opponents are labeling the proconservation group monopolists. They in turn dub the anticonservationists spoilers.

Those old political standbys of the animal world—the hog, spider, and octopus—put in an early appearance. Billboard artists and editorial cartoonists have enlisted these creatures early to typify the character of the other side. Opponents of the measure in their broadsides even have stated that "oil money supports the Arabian slave trade" and a "vote against the bill is a vote against human slavery."

Now they're uneasy . . . Spokesmen for both sides recently expressed concern in private over the effects of this name-calling on the public.

They fear the general public might have the same reaction as the legendary crossroads voter who, when asked what he thought of the two candidates for sheriff, replied: "Judging from the candidates' remarks, we ought to throw 'em both in jail as thiev'n crooks."

Some oil men see such a conclusion developing on the part of the consuming public from the charges of irresponsibility made by both sides. They

(Continued on page 62)

Where the Two Sides Differ

Both sides in California's bitter oil fight profess to favor conservation, free enterprise, fair prices, and the best interests of the state and of national security. Whether the proposed Oil and Gas Conservation Act will accomplish these is the point of disagreement. Here are the arguments:

For the Bill

Conservation

Against It

Sole purpose is to increase oil production by prohibiting wasteful production practices in primary recovery and by making additional oil producible through secondary recovery measures.

Unitization has been delayed in California up to now because it is necessary for 100 per cent of the interests involved to agree. This has been possible where a few interests are involved but utterly impossible when hundreds of interested parties must agree.

California now leads all other states in oil conservation law and practice. It is illegal now to waste oil or gas—by contrast in Texas and Oklahoma gas is wantonly wasted. A higher percentage of oil (25 per cent is produced in California under advanced (secondary recovery) methods and coordinated operation (unitization) than in any other state. California oil conservation under existing laws follows the American pattern of voluntary cooperation, not compulsion.

Free Enterprise

The conservation commission would have no authority to control production rates in a pool unless waste is occurring there.

The state will not be permitted to compel unitization on its own determination. The unit plan must be initiated by the interested private parties. Only after 75 per cent of the interests have reached complete agreement on terms and conditions can a unit proposal be submitted to the commission for approval.

The commission has to be satisfied that minority interests are protected, and after that public hearings are required. Even then if any interest is not satisfied, there is recourse to the courts.

The law would allow a relatively few large operators and international oil companies to sandbag minority interests into line. The effect will be to eliminate incentive on the part of the independents to the over-all detriment of the industry and state.

The law proposes creation of a three-man commission appointed by the governor virtually to control drilling and producing practices.

The commission is granted the broadest control powers including orders limiting the production of oil and gas from any pool or well. It is hardly a voluntary program. It is an arbitrary delegation of power which could mean ruin for any operator in the state.

Monopoly

Proposition 4 is fair to everybody. It will permit the small producer, for the first time to compete with his neighbors, large or small—to participate in the total, extended life of an entire pool—and not be forced out of business when the natural energy of his well is gone and his pump runs dry.

Where one ruthless spoiler may now ruin a field for 100 neighbors—and often does—the act will establish majority rule.

A map of the oil fields in California shows that in the majority of the important fields a combination of a few of the major companies will constitute the necessary 75 per cent "working interest" and the 25 per cent minority, even though they may numerically constitute over 50 per cent of the operators, will be bound by the unit agreement forced upon them.

This is neither fair, just, nor in the best interests of the public or the oil industry.

Public Welfare

By preventing wastage of California's oil resources, the act would:

. . . **Protect against spiralling gasoline** prices—by producing more oil—not less.

. . . **Safeguard against higher taxes**—by adding many million dollars annually to state income.

. . . **Add new wealth**—12 billion dollars by recovering 4 billion more barrels of oil than possible under nonconservation practices.

. . . **Increase employment** in oil and allied industries by extending the life and doubling production of California oil.

. . . **Provide greater national security** by increasing oil reserves and lessening dependence on foreign oil.

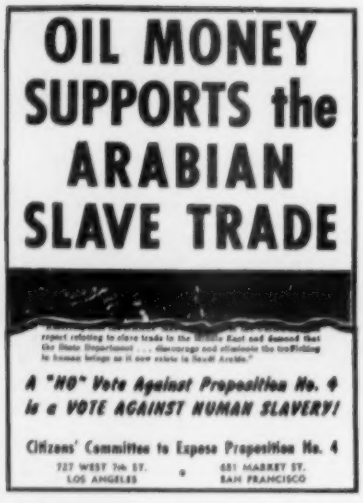
Proposition 4 is deadly to the public interest because:

. . . **Monopoly means higher prices,** a historic, economic fact.

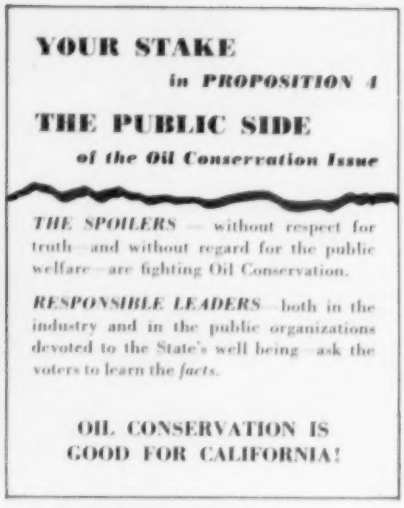
. . . **Jobs would be lost** in basic oil industry, and layoffs would spread to allied industries because of lowered production and higher imports.

. . . **Taxes would rise** with shut-in production from upland and tideland leases.

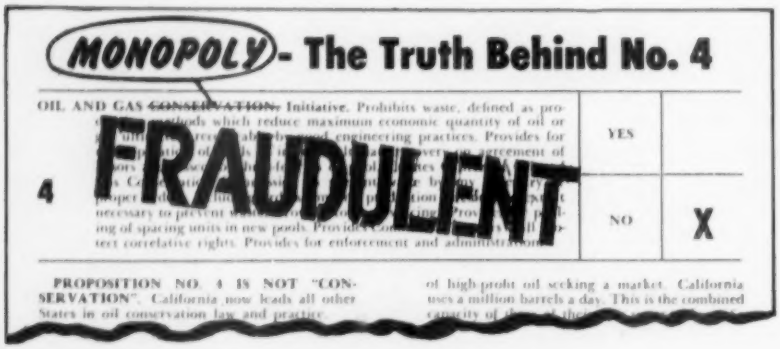
. . . **America's security is threatened** when imports rise and the domestic oil industry grows sick. Eight out of 10 exploratory wells in California last year were drilled by independents, now marked for extinction by the act.


OIL MONEY SUPPORTS the ARABIAN SLAVE TRADE
A "NO" Vote Against Proposition No. 4 is a VOTE AGAINST HUMAN SLAVERY!
Citizens' Committee to Expose Proposition No. 4
727 WEST 7th ST. LOS ANGELES
681 MARKET ST. SAN FRANCISCO

AD in San Diego Light House


YOUR STAKE
in PROPOSITION 4
THE PUBLIC SIDE
of the Oil Conservation Issue
THE SPOILERS — without respect for truth—and without regard for the public welfare—are fighting Oil Conservation.
RESPONSIBLE LEADERS—both in the industry and in the public organizations devoted to the State's well being—ask the voters to learn the facts.
OIL CONSERVATION IS GOOD FOR CALIFORNIA!

LEAFLET of conservation forces



INSIDE OF pamphlet distributed by conservation bill's opponents

reason this easily could lead to a move to harness the industry with legislation not initiated by the industry.

One industry leader observed: "They're going to confirm the average man's bad opinion about the oil business. I hate to see a grand industry tear itself to pieces like this."

All agree there will be plenty of short-range animosities from the battle. But the California industry has been through similar conservation battles twice before in the last 30 years. One executive observed: "We've been sore at each other before, but we got over it."

But others ask: "Will the public forget?"

The issue . . . The battle itself boils down to a fight between groups which historically have been at odds over conservation proposals.

One side advocates a voluntary or "do it yourself" type of conservation law in which the industry more or less polices itself. The other asks some form of legislative controls.

Proponents of the presently proposed act claim the "do it yourself" group actually is a "don't do anything" force. On the other side, opponents contend promoters of the current measure have an eye to shutting in California's production in favor of foreign imports.

Both sides are carrying some inherent advantages into the struggle. Wording of the bill on the ballot tends to favor its backers. It calls for conservation; and as the pundits point out, everyone favors conservation. This is offset, however, by the built-in advantage any group holds in opposing any ballot measure. Polls in California reveal there is an automatic 20 per cent "no" vote against anything presented in the state.

Another issue revolves around secondary recovery and pressure maintenance in oil fields. Both sides agree on the virtue of this.

Opponents of the present proposition, however, point to the great number of such projects now under way in California as ample proof that a law calling for compulsory unitization for pressure maintenance is not necessary.

The advocates cite the town-lot drilling booms which periodically plague the industry in California and instances of unjustified opposition to unit operations by some operators. They claim these as proof that a law is necessary to save California's oil reserves from being wastefully produced under the present "law of capture."

What act offers . . . The proposed act provides, among other things, for compulsory unitization of oil fields where 75 per cent of the royalty interests agree to it.

The purpose, the advocates say, is to conserve reservoir pressures and facilitate secondary-recovery operations. The result will be a big boost in ultimate recovery of oil and greater financial benefits to the state.

The opponents label the act as a production-control scheme which actually will result in California's production being cut back in favor of cheaper imports. They also term it as unnecessary

What's Involved

CALIFORNIA'S controversial Oil and Gas Conservation Act briefly proposes to:

. . . Create a three-member Oil and Gas Conservation Commission, appointed by the governor, to administer the law.

. . . Prevent waste by giving the commission authority to control production, establish spacing rules, and regulate drilling practices. Provision is made that production from a pool cannot be limited to an amount less than necessary to prevent waste.

. . . Increase recovery by authorizing unitization of oil pools. The unit plan must have approval of 75 per cent of working interest holders and 75 per cent of royalty owners. It then becomes compulsory upon all interests.

. . . Set up enforcement machinery by giving commission subpena powers and right to enforce its orders through state courts. Operators not satisfied with commission decisions also have recourse to state courts. Violators may be subject to penalty of $1,000 for each violation and for each day violation continues plus a maximum fine of $5,000 or 6 months' imprisonment.

. . . Assess a production tax to finance the program. The levy will be 2 mills per barrel of oil or each 10,000 cu. ft. of gas produced the first year of the act. The levy necessary for subsequent years will be established by the commission.

imposition of government controls, claiming the industry has policed itself satisfactorily under a voluntary program for years.

How to win the public . . . All these issues involve technical questions. That puts both sides under a handicap in presenting their views to the voting public.

The average voter doesn't know a unit from a ukulele. But he does recognize a good first-class dig when he sees one. So as a matter of practical expediency, both sides have resorted to time-tried mud slinging. They have added the advertising technique of getting endorsements from civic, labor, industrial and military groups, and individuals.

Both sides have succeeded in putting the industry on the spot on at least one count: The price of gasoline.

Prices had better not go up soon in the state. The top line of virtually all campaign literature and billboard advertising put up by both sides says "Keep Gas Prices Down." It now appears this will be accomplished either by a "yes" or "no" vote on the question.

Fresh ammunition . . . New fuel was added to the fight last week when California Atty. Gen. Edmund G. Brown issued his long awaited opinion on the bill. Immediately both sides claimed the opinion endorsed their cause.

The opinion had been requested by an assembly subcommittee and the State Lands Commission. Actually Brown neither endorsed nor condemned the proposed act. He advised he foresaw no lengthy court actions resulting from it.

Brown, however, devoted the bulk of his opinion criticizing use of the initiative referendum technique in putting the measure on the state's statute books. Under California law, the legislature is prohibited from amending any portion of an initiative measure. Any changes must be submitted to a statewide vote again.

Brown also declared the proposition does not authorize production cutbacks for the purpose of controlling prices.

Charles S. Jones, president of Richfield and a cosponsor of the measure, said Brown's statement wrecked charges of opponents that the bill would permit monopolistic practices. The opposition, headed by W. H. Geis and E. G. Starr, said the opinion confirmed their accusations the proposal "puts a noose around the state's neck and hands the rope to eight major oil-importing companies."

Processing BRIEFS

A new superpremium gasoline will be marketed in New England and the Eastern Seaboard states by Richfield Oil Corp. of New York, a wholly owned subsidiary of Sinclair Oil Corp. The new high-quality grade will replace the present premium and will contain an additive understood to be similar to "X Chemical" in Sinclair's new superpremium grade.

A 3,300-bbl. per day catalytic reforming unit will be built at Continental Oil Co.'s 11,000-bbl. Denver refinery as part of a modernization program. The program will cost an estimated $1,400,000. Contractors have been invited to bid on the job, and construction is scheduled to be completed about January 1, 1958.

Built in 1931, the refinery was doubled in capacity in 1938 from 2,000 to 4,000 bbl. per day. Capacity was further increased in 1948 with completion of a $5,800,000 modernization program.

Plans for a styrene plant at Orange, Tex., have been abandoned by Firestone Tire & Rubber Co., but the firm is going ahead with a butadiene plant there. Spokesman blamed a reduction in price of styrene for the change in plans. They pointed out that present producers have knocked 4 cents a pound off the price on long-term contracts. It had been bringing 16 cents a pound. The butadiene plant is scheduled for completion early next year. It will have a capacity of 40,000 tons a year.

The world's biggest butadiene plant is going to get bigger. Capacity of the jointly owned Neches Butane Products Co. at Port Neches, Tex., will be increased from 200,000 tons a year to 300,000 tons. New process units, steam generation, and other facilities will also be added.

Foster Wheeler Corp. will do the process and mechanical design, engineering, and construction work. The plant was purchased from the Government by Texas-U. S. Chemical Co. and Goodrich-Gulf Chemicals, Inc.

Inter-State Oil Co. of Kansas City, Kans., has been sold to key employes who will take over management of the firm October 1. All trade names and assets of the company were included in the transaction. Inter-State, one of the oldest western lubricant manufacturers, has marketed a full line of lubricants for 69 years. L. Wayne Beal is the new president.

Crude purchases of National Co-operative Refinery Association will be cut by 20 per cent in October while the firm's McPherson, Kans., plant is down for fall cleanout, inspection, and repair. The plant buys only in Kansas.

An 11,000-bbl. Ultraformer went into full production last week at the Standard Oil Co. (Ohio) Cleveland refinery. The $5,000,000 unit completes development of major catalytic processing equipment there. The Ultraformer has a feed preparation section and a reaction section in which platinum catalyst in five reactors converts feed to high-octane gasoline components. Four of the five reactors are on stream all the time, while one is regenerating catalyst.

Also for Refiners . . .

Ethyl starts turning out TEL in Canada for first time (P. 53) . . . New plant at Newark will process refinery sludge in world's first continuous processing plan for cresylic acids, cresols, and phenols (P. 55) . . . Chinese refiner develops new method of preparing cat cracker feed. It removes as much "coke former" as possible and keeps loss of heavy fuel to a minimum . . . Continental is using reformer at Billings solely to produce hydrogen (P. 59) . . . American Oil plans asphalt plant at Yorktown with 25,000-bbl. crude and vacuum unit (P. 65) . . . Fuel injection makes its commercial bow this month in new Chevrolets (P. 66) . . . Houdry dehydrogenation unit planned at Odessa butadiene plant (P. 67) . . . Imperial lets contracts for $25,000,000 Sarnia petrochemical complex slated for completion in 1958 (P. 68) . . . Independent, four-company combine make bid to build Turkish refinery (P. 71) . . . Ammonia plant based on fuel oil planned in Mexico (P. 73) . . .

PLUS THESE FEATURES: An operator who tried Platforming at natural gasoline and condensate-recovery plants tells how it can be done successfully (P. 74) . . . Five factors must be considered before choosing an electrical power system for refineries (P. 82) . . . W. L. Nelson explains how his refinery construction index is computed (P. 110) . . . National Petroleum Chemicals finds a safety program that works (P. 112) . . .

Import Figures Cut

Companies report they plan 26,500 bbl. daily decrease for remainder of year, but 1955 total will still outstrip 1956

AUSTIN. — Importing companies' plans for bringing crude and products into this country have been lowered, according to the latest report to the Texas Railroad Commission.

Actual crude imports for August plus company forecasts for the remaining 4 months of 1956 average 990,600 bbl. daily for the 5-month period. The reports made to the commission a month earlier showed a forecast of 1,017,100 bbl. daily for the same 5 months.

Thus, plans for crude imports have been reduced 26,500 bbl. daily. Since most of these reports were made up early in September, they may reflect some revisions of plans for Middle East crude following the Suez Canal crisis.

The new forecast of product imports shows some revisions by months, but the average for the 5-month period is about the same. The average shown on the latest report is 426,700 bbl. daily compared with 426,800 bbl. daily reported a month earlier.

Forecasts of crude imports were revised downward for all the remaining months of the year except for November. The latest estimate for November is 1,027,100 bbl. daily compared with the previous projection of 1,017,600 bbl. daily.

Company reports show that actual product imports for August were 22,000 bbl. daily lower than the earlier forecast for that month.

Out of the total downward revision of 26,500 bbl. daily for crude imports, only 11,000 bbl. daily was for the Gulf-East Coast area. West Coast companies lowered estimates for that area by 15,500 bbl. daily.

Despite the reductions in crude imports planned for the last 5 months of the year, the over-all average for the year will represent a gain of about 14.8 per cent over actual crude reported by these companies in 1955.

What Companies Reported to Railroad Commission

(Thousands of barrels daily)

	Actual*		Estimated or forecast*				
	Aug. 1955	Aug. 1956	Sept. 1956	Oct. 1956	Nov. 1956	Dec. 1956	Jan. 1957
Crude—East Coast							
Atlantic Refining Co.	68.2	79.0	67.3	67.3	67.3	67.3	67.3
Cities Service Co.	32.1	44.8	19.5	30.8	28.0	31.3	28.1
Eastern States Petroleum Co.	25.6	41.9	15.0	24.0	22.5	22.5	22.5
Gabriel Oil Co.		3.5	7.3	7.1	7.3	7.1	7.1
Gulf Oil Corp.	101.0	127.0	139.0	135.0	139.0	139.0	138.0
Hancock Oil Co.			1.8	1.8	1.8	1.8	1.8
Lake Superior Refining Co.		4.0	5.3	5.2	5.3	5.2	(§)
McBride Oil & Gas Corp.	2.6		(§)	(§)	(§)	(§)	(§)
Phillips Petroleum Co.	10.0	11.9	12.0	11.6	12.0	11.6	11.6
San Jacinto Petroleum Corp.			1.8	1.8	1.8	1.8	1.8
Signal Oil & Gas Co.			1.5	1.5	1.5	1.5	(§)
Sinclair Oil Corp.	70.2	67.0	75.5	71.7	71.6	73.5	74.0
Shell Oil Co.		0.5	0.5				
Socony Mobil Oil Co., Inc.	63.7	68.3	74.0	72.5	72.5	72.5	72.5
Sohio Petroleum Co.		3.9	3.5	3.4	3.5	3.4	3.4
Southwestern Oil & Ref. Co.	3.6	3.7	3.8	3.6	3.8	3.6	(§)
Standard Oil Co. of California	64.0	74.5	74.9	74.9	74.9	74.9	74.9
Standard Oil Co. (Ind.)	16.1	20.5	22.9	19.9	36.9	32.5	34.8
Standard Oil Co. (N. J.)†	72.0	72.0	83.0	75.0	75.0	75.0	79.0
Sun Oil Co.	28.0	42.5	60.5	58.4	62.3	54.2	58.2
The Texas Co.	65.5	72.9	65.3	57.2	72.7	79.5	72.5
Tidewater Oil Co.	14.7	27.4	27.3	17.8	47.5	36.5	64.0
Total East Coast	637.8	765.3	761.7	740.5	807.2	794.7	811.5
Crude—West Coast							
Douglas Oil Co. of Calif.		8.1					
Shell Oil Co.	8.2	47.2	49.3	49.7	37.3	45.2	35.1
Socony Mobil Oil Co., Inc.	26.3	29.9	41.8	34.2	34.6	34.2	37.3
Standard Oil Co. of Calif.	88.8	27.4	37.0	37.0	37.0	37.0	37.0
The Texas Co.	13.8	17.4	22.5	27.6	27.0	36.8	22.8
Tidewater Oil Co.	33.3	48.0	36.1	58.6	46.9	41.0	37.3
Union Oil Co. of Calif.		6.5	10.0	10.0	10.0	10.0	14.0
Wilshire Oil Co.		22.6	16.8	5.9	27.1	16.6	16.6
Total West Coast	110.4	207.1	213.5	223.0	219.9	220.8	200.1
Total crude	748.2	972.4	975.2	963.5	1,027.1	1,015.5	1,011.6
Products							
Asiatic Petroleum Corp.	6.6	9.7	7.0	4.3	4.8	4.4	4.6
Eastern States Petroleum Co.	14.0	7.7	10.0	10.0	10.0	10.0	10.0
Gulf Oil Corp.	8.0	5.0	8.0	7.0	7.0	7.0	7.0
Shell Caribbean Petroleum Co.¶	93.0	75.0	100.0	139.0	140.0	184.0	213.0
Shell Oil Co.	25.6	11.4	19.4	23.2	20.8	23.6	25.4
Sinclair Oil Corp.	1.7	2.2					
Socony Mobil Oil Co., Inc.	11.0	10.4	9.3	9.3	9.3	9.3	9.3
Standard Oil Co. of Calif.		13.5	8.4	8.4	8.4	8.4	8.4
Standard Oil Co. (Ind.) ‡	17.8	18.7	23.2	29.5	30.8	38.7	32.3
Standard Oil Co. (N. J.)†**	86.0	146.0	142.0	247.0	247.0	247.0	251.0
The Texas Co.			8.9		4.2	4.0	4.0
Total products	263.7	299.6	336.2	477.7	482.3	536.4	565.0
Total crude and products	1,011.9	1,272.0	1,311.4	1,441.2	1,509.4	1,551.9	1,576.6
Bonded fuel included‡	58.5	92.7	92.3	95.8	94.1	94.4	88.7

*From company reports to the Texas Railroad Commission. †Based on quarterly estimates. ‡Received through suppliers who can furnish either domestic or foreign oil. ¶Imported by independent distributors. ‖Mostly duty free for bunkering ships in foreign trade. **Includes bonded drawback for foreign flag international bunkers as follows: August, 47,000 bbl. daily; September, 51,000 bbl. daily; fourth quarter, 53,000 bbl. daily; January, 49,000 bbl. daily. §No forecast reported.

Tanker Fleet Grows

U. S. yards complete three ships, working on 42 more

WASHINGTON. — American shipyards completed as many new tankers in July and August as in all the preceding 12 months, the Maritime Administration disclosed last week.

Three tankers totaling 83,800 deadweight tons were completed in the 2-month period. In the 12 months ended last June 30, three totaling 82,000 tons were completed.

There were 335 active, privately owned tankers in the U. S. fleet on September 1, the administration reported. There were 46 tankers inactive, 14 privately owned and 32 in the Government's reserve fleet.

But on the same date, 23 new tankers were being built for private account, totaling 514,350 tons, and seven for government account totaling 127,990 tons. In addition, 12 tankers totaling 196,600 tons were being converted. Total cost was estimated at $251,200,000 for private account and $45,600,000 for the Government.

The new vessels will provide an increase in capacity of the U. S. fleet but not in number of tankers. Under the trade-and-build program, 43 tankers will be transferable to foreign flag and 9 will be traded in for addition to the reserve fleet.

Core Drills Errant?

California hearings bring denials and accusations that offshore core holes are being drilled below legal limit

LOS ANGELES.—Companies drilling core holes from floating barges denied at a state assembly subcommittee hearing here last week than any wells have been completed on unleased submerged land.

They also denied exceeding the 500-ft. depth limit set last June for core drilling on unleased lands without a permit. But there were implications that this depth had been exceeded.

Primary purpose of the 2-day hearing was to investigate a deep-sea diver's report of having found a completed oil well on the ocean floor near Coal Oil Point (*The Oil and Gas Journal, July 9, page 62*).

However, the subcommittee probed deeply into the procedures used by the State Lands Commission in leasing submerged state lands. It particularly sought to investigate the commission's action in classifying as "wildcat" acreage a 5,500-acre parcel offshore from Summerland, which may soon be offered for competitive bidding.

Not oil wells . . . R. F. Bauer, manager of offshore operations for Union Oil Co., which is operator for the C.U.S.S. group (Continentatl-Union-Shell-Superior), branded the diver's report as "absurd and erroneous."

What the diver found in an area where Union had conducted core-drilling operations, Bauer declared, was a hexagonal-shaped structure used to combat cratering and to assist in reentering the hole while it was being drilled. It was not blow-out prevention equipment.

It and others had been left in place so that corrosion studies could be made. He said Union has been attempting to develop a technique for drilling from a floating vessel.

"In the conduct of our exploratory operations in the California tidelands, we have not discovered an oil field," he declared. "We have not drilled an exploratory hole wherein producible oil and gas sands were encountered, and no hole we have drilled could possibly be produced as an oil well."

E. G. Bemis, Standard Oil Co. of California, stated that none of its core holes had gone below 500 ft. on unleased submerged lands except those drilled under permit. He added that he had heard rumors of core holes going below 500 ft. without a permit.

W. J. Travers, Richfield Oil Corp. vice president in charge of production, likewise denied that any of its core or test holes had gone below 500 ft., except those drilled on state-granted leases offshore from Rincon and Coal Oil Point.

But he declared flatly that others have gone below the legal maximum without a permit. He said some operators have stayed 3 weeks over a core hole that can be drilled to 500 ft. in a single day. High-operating costs, he pointed out, make it unfeasible to keep a barge inactive that long.

Asphalt Beefing Up

New-roads plan sparks new Amoco plant; may be trend

NEW YORK.—The refining industry is apparently starting to "tool up" in earnest for its role in the federal highway-building program.

American Oil Co. has launched engineering and design work for a 25,000-bbl. crude and vacuum distillation unit for asphalt production at its new Yorktown, Va., refinery.

This is in addition to the 35,000 bbl. of crude capacity nearing completion at the Yorktown plant. Gasoline production is expected to start early in November, with full operation scheduled for early next year.

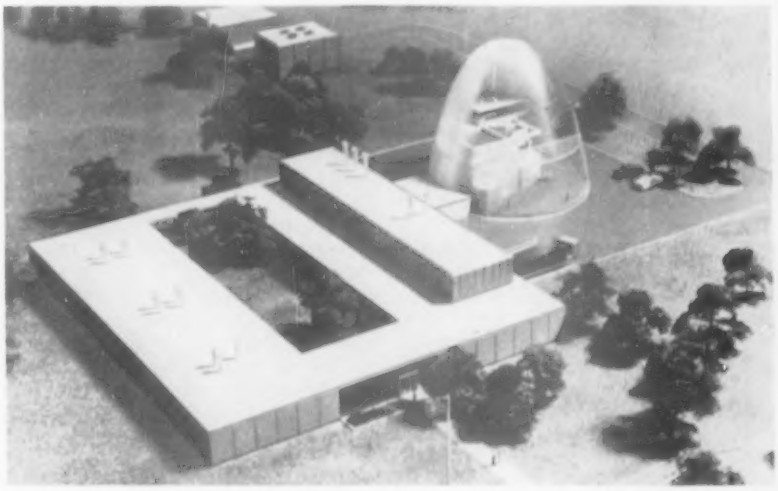
It's too early to determine what the new asphalt capacity will be, but output of other units varies from 40 to 70 per cent of input, depending on design and type of crude used.

Plans for more and bigger asphalt installations have been announced since the highway aid bill was passed, but Amoco is the first to reveal a direct tie-in between the two.

President Donald J. Smith said: "The company's decision is part of a long-range program to expand facilities to meet the needs for road-building materials created by the 13-year federal highway-building program."

Amoco is already one of the largest marketers of asphalt. It produces the product at its 160,000-bbl. Texas City, Tex., refinery and at two smaller plants at Savannah, Ga., and Baltimore.

The company will add further asphalt capacity when it acquires a 35,000-bbl. refinery at Destrehan, La., on completion of a merger with Pan-Am Southern Corp. this fall.



Companies Join for Nuclear Research

NEW YORK.—Ten companies have formed a new company, Industrial Reactor Laboratories, Inc., to build and operate a privately owned nuclear reactor for industrial research in atomic energy. Headquarters of the company will be in Plainsboro, N. J.

Corporations involved are Socony Mobil Oil Co., National Distillers Products Corp., Atlas Powder Co., AMF Atomics, Inc., American Tobacco Co., Continental Can Co., Corning Glass Works, National Lead Co., Radio Corporation of America, and United States Rubber Co.

Gen. Walter Bedell Smith, chairman and president of AMF Atomics, Inc., will head the company as president.

Big-Inch Grid Revised

Colorado Interstate would add punch to system designed to boost gas deliveries into Rocky Mountains, Midwest

COLORADO SPRINGS — Colorado Interstate Gas Co. has redesigned its proposed big-inch pipeline-expansion project for boosting deliveries to the Rocky Mountain and Midwest areas.

An amendment has been filed with the Federal Power Commission seeking changes in the original Beatrice system, proposed earlier this year *(The Oil and Gas Journal, April 9, page 68)*. Hearings will start October 2.

The project would add 734 miles of pipelines, four new compressor stations, and 60,980 hp. in compressor capacity. Some 87 miles of 22-in. line and seven compressor stations will be retired.

The $87,000,000 expansion is planned in connection with Colorado Interstate's trunk system running from the Texas Panhandle to Denver and into Wyoming. It is in addition to an extension being built from Laramie to Green River, where it will connect with Pacific Northwest pipeline.

The new proposal . . . Colorado Interstate now wants to build a 345-mile, 30-in. line from the Kit Carson, Colo., station to Beatrice, Neb., a 215-mile loop from the Texas Panhandle to the Kit Carson station, and a 100-mile, 24-in. line from the Springfield to Pueblo stations, both in Colorado. The 215-mile loop would consist of 26 to 34-in. line.

Other changes include a 24-mile, 24-in. section from Greenwood field in Kansas and a 50-mile, 22-in. extension at Hooker, Okla. The Hooker extension would move recently acquired reserves from Mocane and Laverne fields in the Oklahoma Panhandle.

What it will do . . . The Beatrice line would hook up with the Natural Gas Pipe Line Co. of America system to feed up to 460,000,000 cu. ft. of gas daily into the Midwest. This is an increase of 110,000,000 cu. ft. daily over the original plan.

New facilities would also increase gas going into the Rocky Mountain region. Present deliveries are running 512,000,000 cu. ft. daily. The amendment would add 38,000,000 cu. ft. daily, and make possible a further increase to 800,000,000 cu. ft. daily through the addition of compressor horsepower.

The expansion is part of a 2-year, $120,000,000 program being carried out by Colorado Interstate. Included in the big picture are a transmission line from Rock Springs, Wyo., to Denver, and additions to producing properties and gathering lines.

Big reserves . . . Colorado Interstate revealed that recently acquired natural-gas reserves, mostly in Oklahoma, have increased the proved reserves owned and controlled by the company to approximately 9 trillion cubic feet.

This is enough to provide for requirements of the Beatrice project, estimated at 117.7 billion cubic feet a year for 20 years, with some 6 trillion, 600 billion cubic feet left over for other market requirements. The latter is equivalent to more than 29 years of supply, based on current requirements.

Alberta Crude Dips

Daily nominations fall off by 45,207 bbl. in 2 months

CALGARY.—Alberta's crude production will take another dip in October, according to nomination figures released by the conservation board. Purchasing companies asked for only 412,711 bbl. daily for the month.

This is down 35,987 bbl. from the August high of 448,698 bbl. daily and 9,220 bbl. from the September total of 421,931 bbl. daily. Total drop for the 2 months was 45,207 bbl. daily.

Three long-standing customers were missing from the October purchasing picture when the nominations were filed. They were Great Northern Oil Co. of Pine Bend, Minn.; International Refineries of Wrenshall, Minn.; and West Branch Refineries, Inc., at West Branch, Mich.

Other U. S. refiners will take 94,502 bbl. daily of the Alberta October total. Two big Washington refineries, Shell Oil Co. at Anacortes and General Petroleum Corp. at Ferndale, will account for 78,397 bbl. of this.

U. S. refiners requesting Alberta crude and their daily nominations were:

Shell at Anacortes, 42,000 bbl.; General Petroleum at Ferndale, 36,397; Lake Superior Refining Co., Superior, Wis., 5,200; Northwestern Refining Co., St. Paul Park, Minn., 5,000; Bay Refining Corp., Bay City, Mich., 4,840; Dow Chemical Co., Midland, Mich., 800; and Union Oil Co., Cut Bank, Mont., 265.

Imperial Oil Co. of Canada continued as the biggest bidder with a nomination of 158,325 bbl. daily. British American Oil Co., Ltd., remained in second place with 59,595 bbl.

About 175,310 bbl. of the Alberta total will go east by way of Interprovincial pipeline and 160,545 bbl. will move west through the Trans Mountain line.

Fuel Injection Coming Up

DETROIT.—Fuel injection is due to make its bow October 19 when the new Chevrolets are introduced.

Replacing the carburetor, the system will be offered as optional on production models and as standard equipment on Chevrolet's custom Corvette sports car. Cadillac's El Dorado Brougham is also expected to offer fuel injection as optional equipment when it is introduced early next year. General Motors' Rochester products division will make the new device, details of which are being kept under wraps until the new models are out.

Imports, Exports Both Increase

BOTH imports and exports of crude and petroleum products increased in July, according to the latest report by the Census Bureau of the Department of Commerce.

Some of the highlights of the July report were:

. . . July was the first month with crude imports above a million barrels daily.

. . . The gain in crude imports over June was more than 100,000 bbl. daily.

. . . July was the sixth record month for crude imports in the past year. Records were set in August, November, and December 1955 and in May, June, and July of this year.

. . . Crude from Venezuela topped half a million barrels daily for the first time. July imports exceeded the December record by 33,800 bbl. daily.

. . . Neutral Zone imports reached an all-time high in July if the Census Bureau's figures are correct.

The Neutral Zone is not listed as a shipping country by the bureau, but crude originating in the area can be segregated by gravity classifications. Shipments of Neutral Zone crude are listed with either Kuwait or Saudi Arabia. Imported crude is classified as "under 25° gravity" or "25° gravity and over."

Since Neutral Zone crude is under 25° gravity and crudes from Kuwait and Saudi Arabia are 25° gravity or over, all of the lower gravity crudes are pulled out and listed as Neutral Zone. The Census Bureau reported 39,300 bbl. daily of this crude for July.

. . . Imports of residual fuel dropped to the lowest level since September 1955.

. . . Exports of crude and products increased slightly to put the average for the month above 300,000 bbl. daily.

. . . Gasoline exports averaged 80,200 bbl. daily, the highest since October of last year.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	July 1956	June 1956	July 1955
Crude—			
Mexico	414	603	652
Colombia	620	981	490
Venezuela	16,310	13,584	11,348
Peru			123
Ecuador	121		122
Kuwait	5,036	4,707	4,657
Saudi Arabia	2,789	2,666	2,677
Neutral Zone	1,218	195	
Iraq	1,071	1,374	565
Iran	687	901	895
Qatar	631	734	586
Canada	3,288	2,246	1,343
Far East	1,039	1,087	1,179
Total crude	33,224	29,078	24,637
Daily average	1,072	969	795
Products—			
Residual fuel	10,267	11,359	7,564
Other products	1,658	1,826	1,762
Total products	11,925	13,185	9,326
Daily average	385	440	301
Total all oils	45,149	42,263	33,963
Daily average	1,457	1,409	1,096

EXPORTS*

	July 1956	June 1956	July 1955
Crude	748	866	887
Gasoline	2,487	1,893	2,591
Kerosine	180	209	429
Distillate	1,691	1,544	2,229
Residual	2,055	2,033	2,167
Lube oils	1,034	1,135	1,297
Other products	1,223	926	1,106
Total all oils	9,418	8,606	10,706
Daily average	304	287	345

*Excludes shipments to territories.

Gas Political Outlook Bleak

NEW ORLEANS.—As far as Congress is concerned, the natural-gas industry faces a bleak future.

Gas producers can expect continued government regulation unless the next President, whoever he may be, spurs Congress into relaxing present controls.

These observations were presented to the Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association, by Claude Wild, Washington attorney for the parent association.

Freedom limited . . . Even with active support of the next President, the natural-gas industry should not expect complete freedom from regulation.

He pointed out that the Federal Power Commission is now imposing its controls "all the way down to the royalty owner." He warned that the industry "should fully realize that the day of complete freedom from regulation is gone."

Wild said there are encouraging signs that producers, pipeline companies, and distributors might reach a compromise in a new bill similar to the Harris-Fulbright bill vetoed by President Eisenhower. But he pointed out two such bills have been vetoed by two presidents.

"No Congress, whether it be controlled by the Republicans or Democrats, will be willing to consider any legislation which is not openly, positively, and actively advocated or supported by the President himself . . .

"Even with this support, passage of another bill may have even tougher sledding than the Harris-Fulbright bill . . .

"There is little prospect that we can look for anything but continuing and more vigorous opposition from labor, coal groups, big-city mayors, governors of large consuming states, plus many public service companies who, once having taken a stand, may be slow to change."

Wild added that many congressmen who supported the Harris-Fulbright bill are finding their stand is becoming a campaign issue. "After the abuse they are taking for their vote," he asked, "how many are going to be willing to endure the same thing again?"

Swing to the left . . . Noting a leftward swing in the nation's political thinking in recent years, Wild stressed there is a growing feeling that big business should be regulated.

He predicted this trend will continue as younger men replace veteran congressmen.

Wild also forecast a "serious fight" on depletion allowance in the next Congress. Many liberals in Congress now feel that the oil industry is "on the ropes," he said, and they think they can deliver the knockout blow next session.

Odessa to Use Houdry Unit

PHILADELPHIA.—Odessa Butadiene Co. has been licensed to install a Houdry dehydrogenation process unit at its new plant near Odessa, Tex. The unit will produce 50,000 tons of butadiene annually.

Fluor Corp., Ltd., will construct the unit. It will be completed by July 1957 and will be operated solely for butadiene production.

The butadiene plant is being constructed in conjunction with a synthetic rubber complex planned here by El Paso Natural Gas Co., Odessa Natural Gas Co., General Tire & Rubber Co., and United Carbon Co. *(The Oil and Gas Journal, March 5, page 72).* These four companies own Odessa Butadiene. Output of the plant will supply the butadiene requirements for the rubber complex.

The Houdry process is the only single-step commercial method of processing normal butane gas to make butadiene. The Odessa unit is the seventh Houdry installation to be licensed within a year, bringing postwar licensed production capacity of the process to 290,000 tons per year.

Big Demand Forecast

Chase Manhattan economist expects total U. S. demand to jump 50 per cent in 10 years to 13,000,000 bbl. daily

NEW ORLEANS.—Total U. S. demand is expected to reach "at least 13,000,000 bbl." daily by 1965 for a gain of almost 50 per cent in 10 years.

This long-range forecast was presented by a leading petroleum economist at the annual meeting here of the Louisiana-Arkansas Division, Mid-Continent Oil and Gas Association.

John G. Winger, economist with Chase Manhattan Bank in New York City, pointed out that estimates of oil demand made by experts in the past 20 years have been traditionally low.

"There is evidence that basic factors such as population and the over-all economy will continue to grow," Winger said. "And the march of technology will move ahead.

"All this implies a large-scale expansion in the nation's energy requirements Oil and gas together now supply almost 70 per cent of the nation's energy needs, and the proportion will be larger in the future. We believe the demand for petroleum will average at least 13,000,000 bbl. per day by 1965. That's almost 50 per cent more than in 1955."

The year ahead . . . Winger predicted a 1957 petroleum demand of 9,850,000 bbl. daily for a gain of 5.7 per cent over 1956. This year's demand is expected to be about 6 per cent greater than last year's.

The speaker warned that "tight money" or a mild winter might depress demand in 1957 below his estimates.

However, the Suez crisis might prove to be a force in the opposite direction. American oil exports will soar if traffic through the Suez Canal is disrupted. Winger predicted the U. S. in that case would have to step up its oil exports to Europe by at least 500,000 bbl. per day.

"Currently business-men appear to be optimistic about the prospects for 1957; there is much evidence that the nation's economy will continue to grow," said Winger.

Winger said his preliminary estimates indicate total petroleum demand will average 9,850,000 bbl. daily, including 310,000 bbl. daily of exports.

Winger noted that inventories will not have to be built up in 1957 because they have grown faster than necessary this year.

"Therefore," he said, "the rate of new supply next year won't need to exceed demand. Refinery runs to support demand and inventory requirements should average about 8,300,000 bbl. per day."

He said the national road-building program should be at full speed next year, thereby stimulating the demand for various petroleum products. He anticipates a gain in kerosine demand next year to a total of about 350,000 bbl. daily, partly because of new turboprop airplanes.

Estimated demand in 1957 by products is:

	Thou. bbl. per day	Per cent change
Domestic:		
Gasoline	4,075	+6.5
Kerosine	350	+5.1
Distillate	1,920	+9.1
Residual	1,620	+2.9
All other	1,575	+6.4
Total	9,540	+6.3
Exports:		
Crude oil	30	0.0
Products	280	−11.1
Total	310	−10.1
TOTAL DEMAND	9,850	+5.7

Sulfur Mine Planned in Gulf

HOUSTON.—The first sulfur-mining operation in the open waters of the Gulf of Mexico will be conducted by Freeport Sulphur Co. at one of the largest deposits discovered in recent years.

The sulfur reserves, estimated to contain 30 to 40 million tons, were discovered by Humble Oil & Refining Co. during a search for oil in 1954. They underlie 45 ft. of water in Block 18, Grand Isle area, about 6 miles off the coast of Louisiana.

Mining installations will be mounted on a tall steel structure larger than any of the permanent platforms now used in oil operations in the Gulf. Freeport will use the French process, the injection of hot water into the formation, to lift the sulfur.

Freeport also has a contract with Humble to mine two other sulfur deposits discovered in the same area. Freeport will pay Humble royalties which will give the two firms approximately a 50-50 split on profits.

New Dominguez Flood Set

LOS ANGELES.—Union Oil Co. is preparing to start a new water flood in Dominguez field, where the state's first full-scale flood is paying dividends.

The new flood will be in the third and fourth Callender sands, using six injection wells. About 10,000 bbl. of brine will be injected daily.

Source of the water will be in the Signal Hill field, about 5 miles southeast. It will be transported to Dominguez through old natural-gasoline and crude lines. The flood will be confined to Union properties.

Complex Contracted

Petrochem plants at Sarnia slated for 1958 operation

TORONTO.—Imperial Oil, Ltd., has let construction contracts on its $25,000,000 petrochemical complex at Sarnia, Ont.

Major contractor is Canadian Bechtel, Ltd. Fluor Corp. of Canada, Ltd., will engineer and construct one of the major installations, a $3,800,000 detergent alkylate plant.

The complex will be located on 50 acres adjoining Imperial's 78,000-bbl. Sarnia refinery, largest in Canada. Construction work is expected to start next spring, with completion scheduled for the spring of 1958. Imperial's engineering division will coordinate engineering work.

Raw materials from the refinery will be converted into such basic chemicals as ethylene, propylene, normal butylenes, isobutylenes, butadiene, and aromatic distillates.

The detergent alkylate plant will be the first of its kind in Canada. It will have a rated capacity of 30,000,000 lb. yearly and will also include production of small quantities of other alkylate aromatic compounds, as well as tripropylene and tetrapropylene. The plant will use refinery gases. It will be completed next summer.

Union Polling Barge Crews

SANTA BARBARA, Calif.—John L. Lewis' United Mine Workers Union is holding a bargaining-agent election of 200 oil workers and deckhands operating on five barges drilling core holes off California.

The election was agreed upon by the U.M.W. and William Rand, a contractor who operates the barges. The workers are being polled on a proposal that they join the offshore Petroleum Workers Union, an affiliate of Division 50 of the U.M.W. The National Labor Relations Board is not conducting the election.

The Sailors Union of the Pacific has also been bidding for the offshore workers. Recently the S.U.P. charged Rand with attempting to form a company union for his employes. The NLRB is investigating the charges.

New Outlet Sought

West-Central Texans want tie with West Coast line

DALLAS.—The eastern terminus of West Coast Pipeline Co.'s crude line to the West Coast, if and when it is ever built, may end up being located at Abilene, Tex., rather than as previously planned at Midland 160 miles to the west.

Officials of the West Central Texas Oil and Gas Association told the Journal the association is discussing such a change in West Coast plans with John B. Mills, West Coast president. Mills confirmed this from Phoenix.

West-Central Texas producers have been in a growing cramp for oil markets for months. The association, composed mainly of hard-pressed producers in the Abilene area, has been looking hard for some way of marketing the surplus oil.

The association has sent out questionnaires to its members in an effort to determine how much crude might be available to the project in the area.

Mills said from Phoenix that a minimum of 75,000 bbl. daily of West-Central Texas crude would have to be committed firmly to the line before an extension to Abilene would be feasible. The extension from the Midland area, he said, likely would be 8-in.

Wants U.S. help . . . The West Coast Pipeline president said the long-stalled project still is hoping for a government guarantee against operational losses. The company says it must have such a guarantee before it will be able to obtain adequate financing of the line.

Cost of building the 1,030-mile trunk from Midland to Los Angeles originally was estimated at $106,000,000. A recent decision to lay 30-in. pipe instead of 24 and 26-in., plus the possible extension to Abilene, would hike this considerably.

Cosden Buys Second Refinery

BIG SPRING, Tex.—Cosden Petroleum Corp. has made its second refinery purchase in a week. The Big Spring, Tex., firm took over operation of Onyx Refining Co.'s 7,000-bbl. plant near Abilene October 1. The refinery will operate as a division of Cosden, but will continue crude purchases and marketing of its brand-name products to Onyx jobbers in West-Central Texas.

Earlier in the week, Cosden announced it had acquired Col-Tex Refining Co., with a 12,000-bbl. plant at Colorado City, Tex., in a stock-transfer deal.

Pipeline BRIEFS

Northern Natural Gas Co. has placed a firm order for 350 miles of 26-in. pipe for its big expansion program planned in the Midwest. The order was placed with Kaiser Steel Corp.

Trans-Canada Pipe Lines, Ltd., has let contract for two major crossings of the Assiniboine River. Work is scheduled to start immediately by Marine Pipeline & Dredging, Ltd., Vancouver. The crossings are near Miniota and Portage la Prairie, both in Manitoba. Each crossing will consist of two heavy-walled 34-in. lines, weighted with concrete and buried to a depth of 10 to 15 ft.

Hearings have been postponed indefinitely on applications of five companies for pipeline projects in the Midwest. The hearings were scheduled to open October 2 before the Federal Power Commission. Changes in the program made since the applications were filed was the reason given for the delay.

Companies involved are Natural Gas Pipeline Co. of America, Texas Illinois Natural Gas Pipeline Co., Chicago District Pipeline Co., Pacific Northwest Pipeline Corp., and Colorado Interstate Gas Co.

Canadian Hydrocarbons, Ltd., of Winnipeg has purchased Sturdie Propane, Ltd., Hugh Gas, Ltd., and Propane Gas Service, Ltd., from International Utilities Corp. The deal gives Canadian Hydrocarbons operations throughout western Canada. The firm now owns 64 bulk plants and has 1,200 dealers and 200 vehicles marketing propane at the rate of 952,400 bbl. annually to 45,000 customers.

A subsidiary, Hydrocarbons Pipeline, Ltd., is planning Canada's first major L.P.G. pipeline, an 800-mile section from Edmonton to Winnipeg, plus gathering and storage facilities *(The Oil and Gas Journal, March 5, page 61)*.

A merger is being sought by Texas Eastern Transmission Corp. and its subsidiary, Texas Eastern Production Corp. Applications have been filed with the Federal Power Commission.

The parent company, which owns 93 per cent of stock in the subsidiary, would acquire all assets of the latter. Permission is also being sought for Texas Eastern Transmission to take over the subsidiary's authorization to sell gas to Arkansas Louisiana Gas Co.

Construction of an extended gathering pipeline to Michigan's Reynolds oil field is planned by Leonard Crude Oil Co. of Mount Pleasant, Mich. The line will run approximately 31 miles from the Reynolds field in Montcalm County to the Crystal Station of Michigan-Ohio Pipeline Corp. The 4-in. and 6-in. pipe will have a daily capacity of 4,800 bbl. at 800 psi. Reynolds field is expected to provide around 1,500 bbl. of crude per day when the line is completed.

Tennessee Products Pipe Line Co. has placed a fractionation plant and terminal facilities in operation on a 50-acre Houston Ship Channel site at La Porte, Tex.

The firm is a subsidiary of Tennessee Gas Transmission Co. It separates propane, normal butane, isobutane, and natural gasoline from a mixed stream moving through a new 240-mile pipeline from the lower Gulf Coast. Normal butane will be piped to nearby Petro-Tex Chemical Corp. for use in making butadiene as soon as an expansion is completed there.

Also for Pipeliners . . .

If the Suez is closed, pipeliners would be called on to play the key role of moving excess oil-producing capacity to tidewater. Estimates point to sufficient pipeline capacity to handle the job (P. 52) . . . Pipelines are still feeling the pinch of the steel strike, but most deliveries promised this year are expected to be made . . . Contract awarded for 360-mile gas line in lower British Columbia (P. 54) . . . Colorado Interstate revises plans for expansion, now plans to lay 734 miles of line in move to transport more gas into Rocky Mountains and Midwest (P. 66) . . . Washington attorney for Mid-Continent Oil and Gas Association paints bleak picture for shedding natural-gas controls (P. 67) . . . West Central Texas Oil and Gas Association is making a survey to see how much crude might be moved to California if West Coast pipeline is built (P. 69) . . . Accuracy, reduced cost, other benefits—these reasons make Interstate Oil Pipe Line prefer P.D. meters for crude-oil measurement (P. 67).

New discovery, lake deals mean . . .

. . . Pace Is Quickening in Venezuela

BIG things are still happening in Venezuela. Last week three Lake Maracaibo concessions recently granted by the government were sliced up and a promising discovery was reported in an established producing area of Eastern Venezuela.

Last week's developments saw:

. . . **Venezuelan Leaseholds, C. A.,** negotiate for the cash purchase by five U. S. companies of its 796-hectare Lake Maracaibo concession.

. . . **International Petroleum Co., Ltd.,** an affiliate of Standard Oil Co. (N. J.), take a 25 per cent interest in two concessions granted Mene Grande Oil Co., Gulf Oil Corp.'s wholly owned Venezuelan subsidiary. Another international oil giant, Royal Dutch-Shell, is also expected to get a 25 per cent cut in the Mene Grande acreages.

. . . **Venezuelan Petroleum Co.,** Sinclair Oil Corp.'s Venezuelan subsidiary, announce it has come up with a new and promising field in the western part of Monagas in Eastern Venezuela's Greater Oficina producing area.

Venezuelan Leaseholds deal . . . The deal for the cash purchase of Venezuelan Leaseholds' acreage has not been closed, but the money that is expected to swing the deal, $3,600,000, has been placed with Bankers Trust in New York.

The five U. S. companies involved in the deal are Tennessee Gas Transmission Co., San Jacinto Petroleum Corp., Union Oil & Gas Co. of Louisiana, Murphy Corp., and Lion Oil Co., a division of Monsanto Chemical Co.

On the basis of tentative negotiations, the U. S. group would become outright owner and operator of the concession, with Venezuelan Leaseholds sharing 50-50 in the profits once the U. S. group recovers its expenses.

B. G. Martin, president of San Jacinto Petroleum, said in Houston last week that his company and its partners have deposited the $3,600,000 in New York. He said this sum will reimburse Banco Provincial in Caracas for its loan of the same amount to Venezuelan Leaseholds as soon as the deal is completed.

Henrique Brandt and Reinaldo Herrera Uslar, officers of Venezuelan Leaseholds, arranged for the bank loan in Caracas just 3 days before the deadline for payment to the Venezuelan Government.

Brandt is president of the Venezuelan subsidiary of the parent, Venezuelan Leaseholds, Inc., a Liberian corporation with headquarters in the Bahamas. President of the parent company is L. I Ross, who also is on the board of the subsidiary.

Board members of the parent firm include Sir Sydney Oakes, Sir John Carden, and Nikita Harwich, brother-in-law of Venezuela's minister of interior. Harwich also is on the board of the Venezuelan subsidiary. He is president of Servicios Hydrocarb, an oil-field service company in Venezuela.

The five U. S. companies have not decided how they will operate if the deal is closed. But San Jacinto has tentatively been selected as operator, with the five companies forming a unit operations. Present plans do not include forming a new corporation.

Mene Grande deal . . . Mene Grande, which has so far gotten the lion's share of the choice, semiproved lake acreage, apparently will share its prizes with the Jersey Standard and Shell organizations.

International, owned 82.58 per cent by Jersey Standard, has already acquired its 25 per cent of two Mene Grande concessions and plans to follow through on the remainder. Shell is almost certain to follow suit.

The agreements under which the two companies can acquire an interest in Mene Grande's acreage are almost 20 years old.

In 1937, International acquired a 50 per cent interest in Mene Grande production for $125 million. The agreement gave International the right to acquire a similar interest in any future acreage or production which Mene Grande acquired later. A year after the original deal, International conveyed half its 50 per cent in Mene Grande's operations to Shell.

Michael L. Haider, president of International, revealed recently that his company has already exercised its option for a 25 per cent interest in the first two Lake Maracaibo blocks awarded to Mene Grande. International acquired the interest in areas covering 21,262 acres for $7,250,000.

Haider said his company will also acquire a 25 per cent interest in the other four Lake Maracaibo blocks, covering 108,600 acres, as soon as the awards are made official. Haider said this will cost International $26,400,000.

The International president expects his company's one-quarter share of another four Mene Grande applications for 101,000 acres in southwestern Venezuela to be much less expensive because they are more remote from producing areas.

Shell has made no announcement concerning its possible share of the Mene Grande concessions, but it certainly will follow International's move. It offers both companies the least expensive possible method of acquiring additional Venezuelan production. At the same time they can take advantage of the fact that Mene Grande conducts the operation for them.

Wildcat strike . . . Venezuelan Petroleum tested 689 bbl. daily of 35.1°-gravity crude from its discovery, Aguasay 3 on a block of 92,600 acres. A second location has been staked and will be drilled immediately.

The discovery was drilled to a total depth of 14,221 ft. and encountered what Sinclair calls a "number of potential producing sands." Total sand thickness is 200 ft. The test results disclosed by the company are from the lower sands encountered. Sinclair said thicker and more promising sands are yet to be tested.

The company is studying the possibility of a pipeline from the new field 30 miles north to a 16-in. crude line owned by Sinclair, Mene Grande, and Creole Petroleum Co. (Jersey Standard). Sinclair's interest in this line is used to move the 21,000 bbl. daily in crude production from the company's expanding operations in the Santa Barbara field to Puerto La Cruz.

Daily net production of Venezuelan Petroleum is now almost 26,000 bbl. daily. It was due for a sharp increase before the discovery of the new Monagas field.

Sinclair has just completed its fifteenth producer in Barinas in southwestern Venezuela and has about 17,000 bbl. daily shut in production in this field.

The company and Socony Mobil de Venezuela are building a joint pipeline from Barinas to the Caribbean and Sinclair plans to have at least 25,000 bbl. daily ready for the line when it is completed about the middle of next year. Four rigs are active drilling development wells in Sinclair's Barinas field.

Refiners Woo Turks

Turkish American set to build plant, but fight shapes up as four majors enter scramble for refining toehold

A MAJORS - VERSUS - INDEPENDENT scramble for a toehold on Turkish refining was developing last week as a new independent company prepared to let bids for a refinery in Turkey and four of the world's major companies talked with the government about a counter proposal.

Frank D. St. Hilaire, president of the newly formed Turkish American Oil Co., moved ahead confidently in the face of competition from the majors.

He said his company expected to have proposals from four refinery engineering firms by the end of the week for a 15,000-bbl. refinery at Istanbul. He expects to let contracts for engineering, procurement, and construction shortly afterward.

The counter proposal was being discussed with the Ankara Government last week by California Texas Co. (Texaco and California Standard), British Petroleum Co., Socony Mobil Oil Co., and the Royal Dutch-Shell group.

The four companies are proposing to the Turkish Government that they build a 60,000-bbl. refinery in the country. If the proposal is accepted by the Turkish Government it might scuttle the independent-refinery scheme from an economic standpoint.

The Turks approved plans for the independent refinery to operate on imported crude several months ago *(The Oil and Gas Journal, May 7, page 105)*. Turkish American's refinery output, plus that of the 7,000-bbl. government-owned refinery at Batman, would meet Turkey's domestic needs at the present time. The Turkish American refinery is slated for operation in August 1958.

Outlook for independent . . . Socony and Caltex are the major marketers in Turkey except for a government marketing company which controls a large percentage of the marketing volume. Since the capital of Turkish American is one-third Turkish, it would be in a prime position to furnish oil products for Turkish domestic consumption.

In fact, Turkish American says that once its plant is in operation, the marketers in Turkey will be compelled to purchase products from its output because import permits for foreign exchange would be denied by the Turkish Government.

A big talking point for the private refining company is that it will help reduce the heavy drain on Turkey's foreign exchange. The country has long been hard pressed to buy oil and products.

Socony, Shell and B. P. have been making shipments to Turkey for more than a year on a "cash only" basis. The country owes some $40 million to the three international companies for goods shipped to Turkey on credit.

Wildcat Still Mean

N.I.O.C. delays shutting in well due to high pressures

NATIONAL IRANIAN OIL CO. has a tiger by the tail in its north central Iran wildcat well.

The 5 Alborz blew in wild more than a month ago, flowing more than 80,000-bbl. of crude a day over 200 ft. into the air *(The Oil and Gas Journal, September 3, page 84, and September 10, page 98)*.

Two weeks ago Myron Kinley, Houston oil well firefighter and engineers from N.I.O.C. and the Iranian consortium companies, succeeded in capping the well with a head valve. Since that time, it has been allowed to flow through a 4-in. line moving the crude and gas away from the wellhead.

N.I.O.C. engineers said last week they are afraid to shut the valve because of the well's excessive pressure. Engineers said the valve is rated to take pressures of 12,500 psi., but pointed out that the wellhead pressure is estimated at more than 10,000 psi.

They are afraid they'll be right back where they started more than a month ago if the well is shut in.

The well is still flowing 80,000 to 100,000 bbl. daily into pits hastily built by bulldozers.

Shell Gets Mexican Payment

Mexico has paid Mexican Eagle Oil Co. (Shell) the ninth installment of $8,689,257.

Payment was made under the terms of a 1947 agreement under which Mexico is paying $81,250,000 plus 3 per cent interest from March 1938 to September 1948 as compensation for properties expropriated in 1938. Payments are being made in 15 equal installments due each September 18.

International BRIEFS

Colorado Oil & Gas Corp. will have to make a cash bid for Trinidad Petroleum Development Co. if it wants to clear the first hurdle to adding the Caribbean island producer to its assets.

Great Britain's treasury officials last week turned thumbs down on Colorado Oil's proposal to acquire the Trinidad company through a stock exchange. The stock-instead-of-cash offer was recognized as a possible hitch in the deal *(The Oil and Gas Journal, September 24, page 105)*.

British exchange control regulations will not permit a foreign company to acquire controlling interest in a British company operating in the sterling area by an exchange of stock. If, as is expected, Colorado Oil & Gas now makes a cash offer, this, too, will have to be approved by both the British and Trinidad governments.

Consolidated Cuban I, east of Havana in the old and nearly depleted Bacuranao field, has attracted and retained the interest of Cuban observers by its sustained production and lack of decline.

The well, drilled by Cia. Perforadora de Las Antillas and later purchased by Consolidated Cuban Petroleum Corp., was spudded January 31 with a cable-tool rig. It was bottomed at 1,180 ft in May. During August the well produced an average of about 290 bbl. daily of 27.8°-gravity crude. Other wells in this region flowed from 5 to 10 bbls. daily on initial tests, but then dropped rapidly.

British Petroleum Co., Ltd., will carry on a joint exploration program on the east coast of North Island, New Zealand, with Todd Brothers, a local firm. Both companies already hold prospecting licenses in the area. The project will be in addition to a program on the west coast of the island, in which B.P., Todd Brothers, and Royal Dutch-Shell are participating.

The first 1,650 bbl. of oil products from locally produced and refined crude have been sold in Israel to three marketing companies. The crude from Heletz field in southern Israel was sold to Consolidated Refineries, Ltd., for processing in the Haifa refinery, at the same price of imported crude landed in Israel.

Oral proceedings have ended in the oil transportation dispute between Arabian American Oil Co. and Aristotle S. Onassis, Greek shipowner. The three-man tribunal is expected to reach a decision several months after final papers are filed in November.

Output Tops 15 Million

Free world establishes production record as Middle East and Venezuelan wells hit new high, U. S. output declines

FREE world crude production passed the 15-million barrel daily mark for the first time in July, led by record output in the Middle East and Venezuela.

The high of 15,054,800 bbl. daily resulted from an over-all gain of 83,100 bbl. daily from June. Foreign output of 7,964,800 bbl. daily was 12 per cent greater than United States production, which was off 10,000 bbl. daily to 7,090,000 bbl. daily.

Middle East output also reached a higher rung on the production ladder, passing the 3.8 million barrel daily level for the first time with a record 3,800,100 bbl. daily.

Companies in Iraq produced a new high of 763,800 bbl. daily, a gain of 50,500 bbl. daily. Qatar production also set a record at 130,400 bbl. daily. While not setting a new high Kuwait production rose 51,600 bbl. daily to 1,204,700 bbl. daily.

Saudi Arabia was the only Persian Gulf producer reporting a decline. Output was down 49,700 bbl. daily to 1,033,600 bbl. daily. But on a January-July basis, the kingdom made a greater gain over the same period last year than any other major producer in the area except Iran. The Saudi 7-month average of 1,045,100 bbl. daily was a gain of 101,100 bbl. daily, or 10.7 per cent, over last year.

Fields in Iran produced 597,000 bbl. daily, a gain of 26,000 bbl. daily over June, and an increase of 245,000 bbl. daily over July 1955. Before nationalization in 1951, Iran's best year was 1950 when 665,400 bbl. daily were produced. July output was higher than the average of the second best year, 1949, when 561,800 bbl. daily were produced.

World-Wide Crude Production

(Daily average in thousands of barrels)

Country—	July 1956	June 1956	July 1955
Western Hemisphere:			
Argentina	84.2	84.2	82.5
Bolivia	8.5	8.5	8.5
Brazil	6.0	5.7	5.5
Canada	444.0	440.8	199.6
Chile	10.0	9.8	6.9
Colombia	119.7	124.4	108.5
Cuba	1.5	1.3	1.2
Ecuador	10.0	9.8	10.0
Mexico	260.0	260.0	253.6
Peru	49.9	49.9	47.0
Trinidad	78.5	78.5	66.7
Venezuela	2,459.2	2,446.2	2,101.1
Total	3,531.5	3,519.1	3,091.1
W. Europe & Africa:			
Algeria	0.7	0.7	1.1
French Morocco	2.2	2.2	2.0
Egypt	37.9	38.6	34.3
Austria*	63.4	63.9	
France	23.8	23.8	18.2
West Germany	69.2	69.2	62.7
Italy	11.5	10.8	4.4
Netherlands	21.1	21.0	19.1
Turkey	0.6	6.0	6.4
United Kingdom	1.2	1.2	1.0
Yugoslavia	5.5	5.3	5.1
Total	237.1	242.7	154.3
Middle East:			
Bahrain	30.0	30.0	30.0
Iran†	597.0	571.0	352.0
Iraq‡	763.8	713.3	656.2
Israel	0.6	0.6	
Kuwait	1,204.7	1,153.1	1,151.7
Neutral Zone	40.0	39.7	25.0
Qatar	130.4	122.7	116.1
Saudi Arabia	1,033.6	1,083.3	942.4
Total	3,800.1	3,713.7	3,273.4
Other Asia:			
British Borneo	115.0	115.0	112.0
Burma	5.2	5.2	4.0
India	7.5	7.5	7.5
Indonesia	250.0	250.0	235.0
Japan	5.9	6.1	6.2
New Guinea	6.8	6.7	8.8
Pakistan	5.7	5.7	5.9
Total	396.1	396.2	379.4
Total Free World Foreign	7,964.8	7,871.7	6,898.2
United States	7,090.0	7,100.0	6,632.0
Total Free World	15,054.8	14,971.7	13,530.2
Communist Countries in Soviet Orbit:			
Russian Zone of Austria*			68.2
Romania	150.0	150.0	125.0
Russia	1,600.0	1,600.0	1,260.0
Others	50.0	50.0	36.8
Total	1,800.0	1,800.0	1,490.0
World total	16,854.8	16,771.7	15,020.2

*Austria took over its producing fields from Russia in August 1955.

†Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies.

‡Includes estimated 3,800 bbl. daily this year and 12,000 bbl. daily in 1955 from Naft Khaneh field, operated by British Petroleum Co. rather than I.P.C.

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where complete current reports are lacking. Communist countries in the Soviet orbit include satellite countries in Europe and Red China.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total, non Communist countries
1955—			
July	3,091.1	3,273.4	6,898.2
August	3,140.4	3,243.0	6,978.2
September	3,130.9	3,256.9	6,990.7
October	3,179.6	3,378.2	7,166.0
November	3,255.0	3,386.0	7,248.3
December	3,298.5	3,316.1	7,227.2
1956—			
January	3,363.7	3,392.6	7,368.5
February	3,426.2	3,415.7	7,453.4
March	3,471.2	3,624.3	7,713.8
April	3,320.5	3,736.6	7,690.8
May	3,356.5	3,793.9	7,788.1
June	3,519.1	3,713.7	7,871.7
July	3,531.5	3,800.1	7,964.8

Venezuela climbs . . . Venezuelan output rose 13,000 bbl. daily to a new high of 2,459,200 bbl. daily, the second high in a row. The 7-month average rose to 2,376,900 bbl. daily, an increase of 275,800 bbl. daily, or 13.1 per cent, over last year.

Creole, the leading producer, had an output of 1,084,800 bbl. daily.

The output of other companies included: Shell, 703,300 bbl. daily; Mene Grande, 370,900 bbl. daily; Socony Mobil, 101,500 bbl. daily; Mercedes, 23,500 bbl. daily; Richmond, 59,300 bbl. daily; Texas, 48,600 bbl. daily; Atlantic, 18,800 bbl. daily; Sinclair, 29,900 bbl. daily; Phillips, 10,400 bbl. daily; and Pantepec, 5,300 bbl. daily.

Austria down . . . Output in Austria showed a decline of 500 bbl. daily, bringing total production down to 63,400 bbl. daily. A gradual cutting-back in production has been more or less continuous since Austria regained its fields from Russia in August 1955. Output on a yearly basis last year averaged 68,200 bbl. daily.

The 1 Puchkirchen, a new one-well field in Western Austria operated by a joint Socony Mobil and Royal Dutch-Shell company, had an output of 108 bbl. daily.

Africa Gets New Field

An offset well drilled near Port Gentil in French Equatorial Africa has confirmed an oil field.

The test, located at Pointe Clairette on the Atlantic Coast of Gabon, was drilled by Ste. des Petroles D'Afrique Equatoriale Francaise.

Crude flowed from three horizons

on initial tests. The lowest zone flowed at the rate of 156 bbl. per hour; the middle zone, 126 bbl. per hour; and the upper zone, 38 bbl. per hour. Depth of the zones was not given, but total depth of the well was 3,690 ft. The hole is being deepened.

This test and earlier promising results have enabled the company to plan commercial production next year. Output is expected to average about 2,000 bbl. daily. The first tanker shipment from Port Gentil is due in March.

Concession Granted

Guatemalan area goes to Socal, others to aid search

THE fourth exploration concession in Guatemala went to Standard Oil Co. of California last week as the government began official awards of acreage that have been held up by extensive overlaps of applications.

California Standard was granted a block of 27,000 hectares (66,717 acres) in norther Izabal Province along the Caribbean shore.

Actual title to the block is vested in a Guatemalan subsidiary of Socal, but six other companies will participate in the exploration. They are subsidiaries of Ohio Oil Co., Standard Oil Co. (Ohio), Bandini Petroleum Co. of California, Texas Petroleum Co. (Texaco), Signal Oil & Gas Co., and Petroleos Guatemaltecos, a Guatemalan company.

A week earlier the government revealed the grant of about 650,000 acres in southwestern Peten to Ohio Oil Co., with Socal and Union Oil Co. of California participating as minor interest holders.

Oil Keeps Pace in NATO

The $298,000,000 petroleum phase of Europe's joint-defense system is moving ahead in step with other segments of the $2,057,000,000 over-all program, President Eisenhower disclosed last week.

The President's annual report to Congress on the mutual security program revealed that more than half of the 4,500 miles of jet-fuel pipelines and 450,000,000 gal. of fuel-storage capacity is under construction.

The program, developed by the North Atlantic Treaty Organization, originally called for the building of 172 tactical air fields and a number of naval bases. But the entry of Germany into NATO and new concepts of warfare will call for another 50 airfields at a cost of $300,000,000 to $350,000,000, the President said.

In jungle or suburbs of Karachi . . .

. . . Spotlight on Pakistani Tests

PAKISTANI officials have their fingers crossed that a wildcat underway on the outskirts of Karachi will turn the capital city into the Long Beach or Oklahoma City of Southeast Asia.

The well is on a 12-acre lease. It is located near a main thoroughfare on the outskirts of the city. A commercial discovery would pose many problems that would have to be ironed out before development drilling could start. But there is hope the Government would pitch in and help smooth out any domestic difficulties. The Government is a partner in the operating company and is anxious also to develop crude production which the country needs badly.

Pakistan Petroleum, Ltd., is drilling the test, now past 2,000 ft. Projected depth is 10,000 ft. The company is owned 70 per cent by Burmah Oil Co., Ltd., and 30 per cent by the Government.

In contrast to the Karachi test, an offset to a high-pressure gas discovery in East Pakistan is located in jungle country. But from the industry point of view, it is probably watched with more interest than any other well in the company's drilling program.

The 2 Sylhet has passed 8,000 ft. and is drilling ahead. Sixteen months ago, the first test met a gas formation at 7,800 ft. It cratered, and the rig and drilling equipment were destroyed by fire.

Special care is being taken with the offset. A trial hole was drilled to 2,000 ft. to make certain high-pressure gas had not built up in shallow sands. The heavy rig installed can go to 16,000 ft.

The public came to see this test . . .

. . . but oil men are watching 2 Sylhet.

Ammonia Plant to Use Fuel Oil

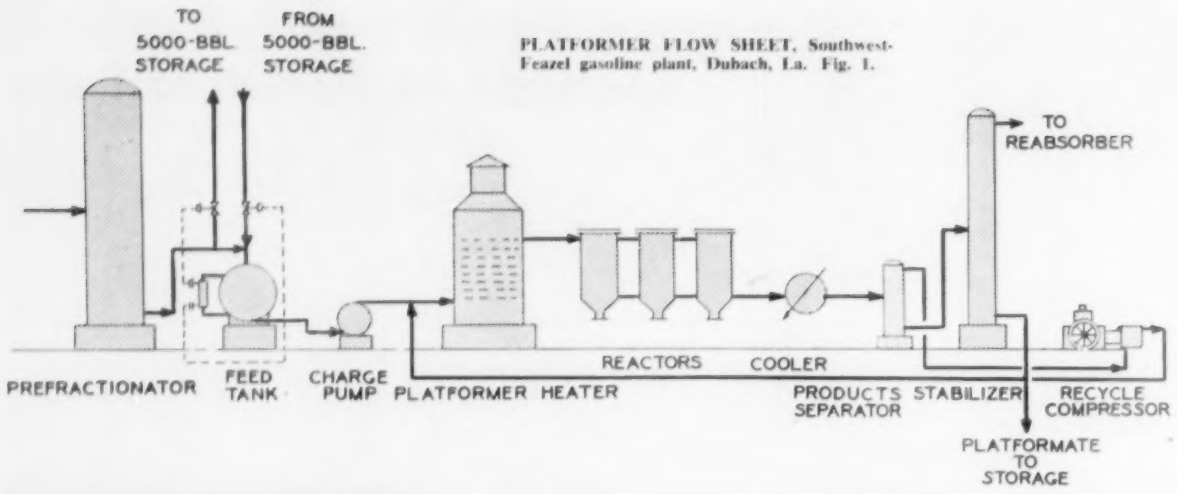
A 30,000-ton-per year synthetic anhydrous ammonia plant using fuel oil as a raw material is planned for the west coast port of Guaymas, Sonora, Mexico.

A new company, headed by Bruno Pagliai, is being formed to build the plant at a cost of about $8 million. Construction is due to start next month after bids are received from contractors.

The plant, as planned, will operate on the synthesis-gas generation process developed by Texaco Development Corp. and licensed jointly by Texaco and Hydrocarbon Research Institute. The company plans to purchase the fuel-oil raw material from Petroleos Mexicanos (Pemex).

Beachhead for French . . . A French petrochemical firm, Etablissements Kuhlmann, Paimboeuf, France, established a "first" early this month when it produced its first tank car of ammonia from heavy fuel oil using the same process.

The French firm barely beat out Northern Chemical Industries of Searsport, Maine, for the honors in the first heavy-oil conversion to ammonia in a plant designed exclusively for that process. Northern Chemical expects to be making ammonia soon.



PLATFORMER FLOW SHEET, Southwest-Feazel gasoline plant, Dubach, La. Fig. 1.

PLATFORMING—A Means of Upgrading

Motor Fuels in Natural-Gasoline Plants

Here's the experience of an operator who's tried it successfully

by R. F. Cox and R. H. Killgore

EXPERIENCE at the Dubach, La., plant of Southwest Gas Producing Co., Inc., and Feazel Interests proves the feasibility of Platforming in conjunction with natural gasoline-condensate recovery plants. It affords a way for the producer to remain in the competitive motor-fuel market with a practical capital outlay.

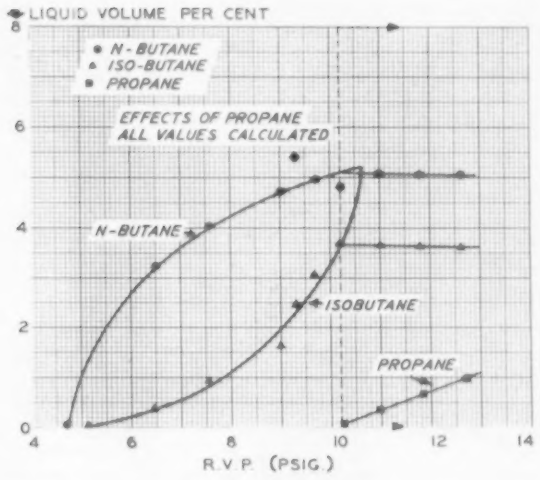
The unit was built in November 1955 by Fish Engineering Co., of Houston. It is of typical design for such units, but the application to the processing of condensate is unusual.

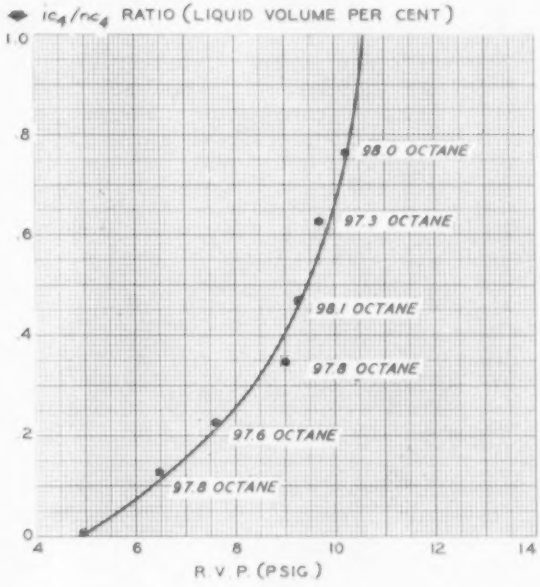
The Platformer was designed on the basis of 2,000-bbl. per day charge rate for the production of 95-octane-number product, with 3 cc. of TEL, or for 1,500-bbl. per day charge in making 98-octane-number product, with 3 cc. of TEL. After 8 months of operation, the unit has proved itself capable of fulfilling all design conditions. The catalyst has processed a cumulative feed stock of more than 60 bbl. per lb., and operating results indicated very little loss of activity.

Motor-fuel product . . . Since 1948 Southwest-Feazel have operated a natural-gasoline plant which processes pro-

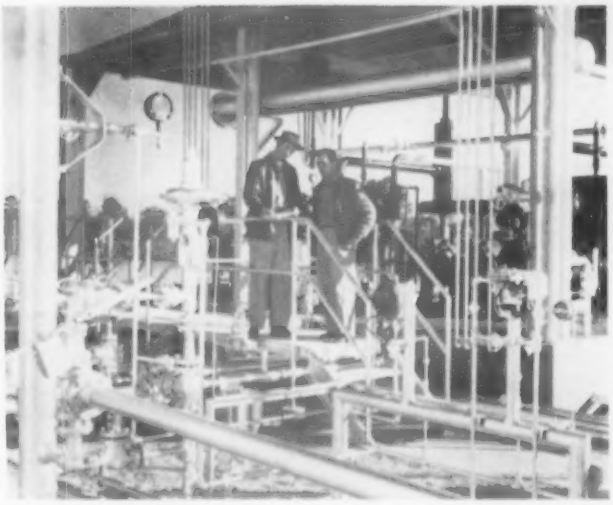
Authors are with Southwest Gas Producing Co., Inc., Monroe, La.

FIELD PROCESSING





RELATION of light components (curves at left) in reformate to vapor pressure and octane. Fig. 2.



RECYCLE gas compressors (above) boost pressure on hydrogen recycled to the Platformer reactor. Building has open sides to keep hydrogen from accumulating in a closed area.

duction from gas condensate reservoirs in the area. The gasoline plant is of the absorption-refrigeration and products-fractionation design and makes finished motor fuel as one of its products. With the use of 3 cc. of TEL and straightrun motor fuel has a research octane of 82.5.

The motor-fuel fraction represents approximately 55 per cent of the total liquids production from the gasoline plant and is therefore a major source of revenue from its operation. To remain in the competitive motor-fuel market it was apparent in the latter part of 1954 that some steps would be necessary to improve product quality.

A thorough engineering study was conducted to evaluate available processes or methods to improve octane quality which could be operated in conjunction with the gasoline-plant operations. Blending upgraded naphthas purchased from outside sources proved impractical due to freight and handling costs. Economic studies showed the need for a process to accomplish the upgrading at the source of motor-fuel production, and resulted in the choice of Platforming as the process to be used.

The Platformer was one of the first units to be constructed and operated in conjunction with a gasoline-plant processing facility in the nation, and is unusual from the standpoint of certain design features which were incorporated for maximum efficiency and flexibility.

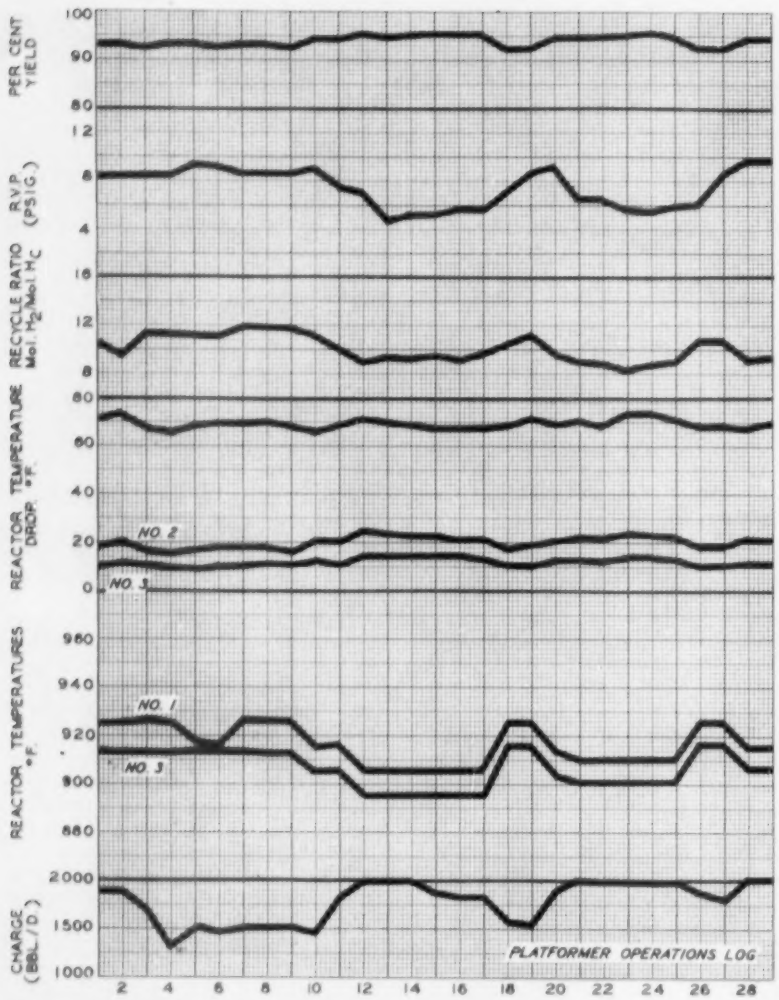
Throughput varies . . . The plant disposes of residue gas from the absorption system through two of the major crosscountry transmission lines and does not cycle any of its gas back to a reservoir. The plant is thus subject to varying load factors which in turn vary the fluid production from the fractionation section through ranges of 50 to 200 per cent of the daily average annual load.

From a technical operation standpoint the desirability of a constant charge rate can well be appreciated, since a Platformer is sensitive to feed-rate changes. from the standpoint of reformate quality, at a given set of operating conditions. In addition, certain precautionary measures must be incorporated in routine operation to protect the unit from excessive temperature fluctuations within the reactor section and thereby prevent damage to the platinum catalyst. Further, a minimum hydrogen-to-hydrocarbon ratio must be maintained in order to operate the unit at maximum efficiency and minimize the possibility of carbon deposits on the catalyst beds.

Storage built . . . The problem was eliminated by the installation of a 5,000-bbl. storage tank which receives the excess 200°-400° F. naphtha charge stock from the gasoline plant fractionating section. In the gasoline plant fractionating section the prefractionator prepares the feed stock used by the Platforming unit. After cooling to 130° F., the feed is transferred to the Platformer feed-surge tank which has a total capacity of 55 bbl. The small capacity of this tank does not allow for surges in production from the prefractionator.

A system of level control is used on this tank so that any production from the prefractionator which is in excess of the current charge rate to the Platformer flows into the naphtha storage tank. Supplementary feed is obtained from storage when production of naphtha from the prefractionator is less than the current charge rate to the Platformer (see Fig. 1).

Naphtha temperature in the storage tank is 85° F. while that of naphtha



PLATFORMER OPERATIONS LOG is used for maintaining close operating supervision of the unit. Fig. 3.

TABLE 2—PROCESSING CONDITIONS—TEMPERATURES AND PRESSURES

	Temp. (°F.)	Press. (psig.)
Compressor discharge		545
No. 1 reactor inlet	924	511
No. 1 reactor outlet	856	501
No. 1 delta T	68	
No. 2 reactor inlet	914	
No. 2 reactor outlet	897	489
No. 2 delta T	17	
No. 3 reactor inlet	914	
No. 3 reactor outlet	905	485
No. 3 delta T	9	
Total reactor delta T	94	
Separator	80	457

OTHER PROCESSING CONDITIONS

LHSV	1.9
Recycle gas flow, M.M.s.c.f./d.	19.5
H_2/HC molal ratio	12.0
Catalyst life at end of test, bbl. per lb catalyst	3.8

from the prefractionator is 130° F. In supplementing the feed available from the prefractionator with naphtha from the storage tank (rather than taking all Platformer feed from the storage tank) a considerable amount of the heat content is utilized, thus reducing the over-all heating cost. The storage tank is of atmospheric design, but equipped with vapor seal and gas blanketing to assure an oxygen-free feed.

The feed preparation and flow system has given the flexibility needed in the operation of the Platformer and has made it possible to operate on a specified charge rate and maintain that rate for periods of up to a week before making any adjustment. The rate is periodically adjusted so that the naphtha storage tank is kept approximately half full.

Results . . . The reformate is used as a blending agent with a stabilized natural gasoline to turn out 95 and 88-octane-number motor fuel. Table 1 shows the characteristics of the reactor charge, the reformate, natural gasoline, premium, and regular-grade motor fuels. Examination of the various characteristics set forth in the table gives an indication of the octane appreciation through the Platformer and the resultant effects of the blending with natural gasoline. The 95-octane-number motor fuel has a higher average boiling range than the 88-octane-number because of the necessarily higher concentration of reformate.

Since putting the Platformer on stream several performance tests have been run to obtain confirming data as to its efficiency and flexibility. Table 2 shows the average temperature and pressure conditions prevailing during a

TABLE 1

	Reactor charge	Platformate	Natural gasoline	Premium motor fuel	Regular motor fuel
I.b.p., °F.	200	128	98	94	106
5 per cent	221	167	110	120	125
10 per cent	226	191	113	130	128
20 per cent	232	204	116	144	135
30 per cent	239	217	119	160	140
40 per cent	250	228	122	178	150
50 per cent	260	238	126	197	162
60 per cent	274	250	131	214	178
70 per cent	290	267	138	235	198
80 per cent	310	288	148	260	228
90 per cent	335	316	160	296	272
95 per cent	350	342	175	322	307
End point	392	388	212	385	355
Rec.	99.5	98.0	98.0	98.0	98.0
Res.	0.5	1.0	1.0	1.0	1.0
Loss	0.0	1.0	1.0	1.0	1.0
°A.P.I. gravity	55.7	54.4	81.8	60.8	69.8
R.v.p.	0.5	2.8	11.0	8.8	8.8
Octane number:					
Clear	47.1	89.4	67.1		
+3 cc. TEL	72.1	98.4	87.9	95.3	
+1.68 cc. TEL					88.0

typical performance test. Table 3 shows production distribution and characteristics of the gas streams from the unit. Table 4 shows the component distribution of the reformate. The ring balance indicates the degree of aromatics production and of naphthene conversion. When considered on the basis of charge stock, the comparison of hydrocarbon ring types gives an excellent picture of how the upgrading is accomplished as well as a measure of severity of conversion.

Table 4 shows reformate is made up of propane and heavier components, with the C_6+ fraction have PONA composition as indicated under the ring balance. Since yields from the Platformer are influenced by the amount of lighter components retained in the reformate, it is desirable to maintain as high a retention percentage of propane, isobutane, and normal butane as is practical and yet remain within vapor-pressure specifications on the finished product.

Actual operating experience has indicated a desirability of sacrificing yield to the extent of removing all propane and isobutane from the reformate by topping with the stabilizer, and to supplement these components with normal butane from the natural-gasoline stream. Although propane and isobutane are high contributors to the total octane, their component vapor pressures limit the amounts which it is practical to leave in the reformate.

Removal of these components with later replacement with normal butane actually allows a higher octane at a given vapor pressure standard than is possible by leaving them in the reformate. Fig. 2 shows the relationship between these lighter components and the vapor pressure and octane of the reformate. It is based upon actual analytical data developed under operating conditions and has been found to give results of sufficient accuracy to predict results when changing operating conditions.

The undesirable light components removed from the top of the Platformer stabilizer are routed back to the gasoline-plant absorption fractionation system for recovery and separation into individual components. This system lends itself very well to the production of any desired vapor-pressure reformate without sacrificing yield. Loss consists predominantly of hydrogen which is used as fuel in the Platformer heater. The Platforming process generates hydrogen in excess of its own heat requirements and excess is diverted to the gasoline plant fuel system.

Operations log . . . For purposes of close operating supervision a number of conditions pertinent to the operation of the Platformer are checked at frequent intervals and the data recorded on an operations log. From the log, the data are plotted on a strip chart of convenient size for reference and observation of any drastic change in Platformer performance. Fig. 3 is a reproduction of the type of data accumulated and represents a month's operation.

The process engineer can readily observe change in operating conditions over periods of time and predict loss in catalyst activity and replacement of same. Further, adverse processing conditions which might be harmful to the catalyst or to other parts of the unit can be spotted in time to allow remedial action.

In blending operations of this type the quantities of the different octane fuels are governed by the marketing conditions prevailing at any given time. In practice it has been found that it is possible to turn out a motor-fuel fraction capable of being blended into the two required grades on the ratio of 40 per cent of 95+ octane number and 60 per cent of 88 octane number for a pool octane of 91.0+ with a weighted average lead content of 2.25 cc. per gallon.

TABLE 3—PRODUCT DISTRIBUTION

Plant streams—	B/D	M.s.c.f./d.	°A.P.I. or sp. grav.	Lb./day	Wt. %	LV %
Reactor charge	1,506		55.1	399,315	100.0	100.0
Net separator gas		824	0.212	13,392	3.4	
Stabilizer gas		255	1.20	23,352	5.8	
Platformate	*1,362		54.3	*362,571	90.8	90.5
				399,315	100.0	90.5

*By difference, based on 100 per cent weight recovery.

Corrections to observed data based on calculated specific gravities from M.S. analyses of separator and stabilizer gas made as follows:

	Separator gas			Stabilizer gas		
	Mol. %*	M.W.	Lb./hour	Mol. %*	M.W.	Lb./hour
H_2	86.65	1.75	159	12.29	0.25	7
C_1	4.72	0.76	68	4.93	0.79	22
C_2	3.42	1.03	93	21.55	6.48	181
C_3	3.21	1.42	129	59.41	26.20	733
i-C_4	0.90	0.52	47	1.82	1.06	30
n-C_4	0.80	0.46	42			
C_5+	0.30	0.22	20			
	100.00	6.16	558	100.00	34.78	973

Specific gravity from analyses:
Separator gas 0.212 Stabilizer gas 1.20

*Corrected for CO content.

TABLE 4—SUMMARY OF PRODUCTS

Component	Platformate Vol. %	Platformate B/D	Platformate Lb./hr.	Total off gas B/D	Total off gas Lb./hr.	Total prod. B/D liquid	Total prod. Lb./hr.	Wt. %	Vol. % or (s.c.f./b.) charge
H_2					166		166	1.0	(505)
C_1					90		90	0.5	(33)
C_2					274		274	1.6	(55)
C_3	0.1	1.3	10		862		872	5.3	(119)
i-C_4	3.5	47.7	393	9.2	77	56.9	470	2.8	3.8
n-C_4	5.0	68.1	580	4.9	42	73.0	622	3.8	4.8
i-C_5	5.0	68.1	620	1.4	13	69.5	633	3.8	4.6
n-C_5	3.6	49.0	450	0.8	7	49.8	457	2.7	3.3
C_6+	82.8	1,127.8	13,042			1,127.8	13,042	78.5	74.9
	100.0	1,362.0	15,095	16.3	1,531	1,377.0	16,626	100.0	91.4
Reactor charge						1,506.0			
Separator gas									(547)
Stabilizer gas									(169)

RING BALANCE

Volume per cent	Charge	C_6+ Platformate	C_6+ Platformate based on charge
P	54	44	33.0
O	Trace	Trace	
N	26	5	3.7
A	20	51	38.3

Net aromatics = 38.3 − 20.0 = 18.3 volume per cent.
Naphthene conversion = 26.0 − 3.7 = 22.3 = 85.8 per cent.

Fluid-operated valves using a common reservoir of supply gas provide

Flexibility in Gas-Lifting Multiple Completions

Gas input is adjusted at surface, and valves do the brain work

by William B. Adair

MOST of the problems of gas-lifting production from multiple-zone wells can be solved by fluid-operated valves utilizing a common reservoir of supply gas. Such a system is capable of lifting required fluid volumes for most multiple-zone wells and yet maintains simplicity of control and flexibility of operation.

Each string in the well has a set of fluid-operated valves. Each set of valves receives its supply of gas from the common reservoir as the influx of fluid from its producing zone requires.

Some of the features of this type of system are:

1. Valve interference is eliminated. Gas-supply pressure variations are relatively unimportant because the fluid-operated valves receive their opening and closing signals from the zone being lifted.

2. Depth of lift and amount of production may vary widely between the different zones being lifted. High-fluid producers may be lifted with the same gas supply as low producers.

3. Full available gas pressure is carried to the operating valve in each string. The use of fluid-operated valves makes variance or reduction of gas pressure unnecessary.

4. There is no need for complex surface gas-control equipment. A choke in the gas input line is normally used.

5. Gas starving of one string of valves is eliminated because each string of valves is designed to utilize the same gas pressure, regardless of depth of operation.

Valve performance . . . Fluid-operated valves provide a unique and important feature of being able to successfully utilize a common gas reservoir with satisfactory results.[1] This is true in both intermitting and continuous-flow lift as well as in combinations of both where one valve string may be intermitting while the other constantly flows.

Gas input is adjusted at the surface to provide the necessary gas for lifting the desired amounts of fluids. Valve port sizes should be designed to pass the necessary gas volume to slug-lift the predetermined fluid head at approximately 1,000 ft. per minute. Then, should the well lift become continuous flow, gas input may be adjusted at the surface to regulate production.

Intermittent flow . . . The intermittently produced gas-lift well has a producing capacity depending on tubing size, available gas pressure, and depth of lift. The predetermined fluid head which opens the fluid-operated valve may be approximated by the following empirical formula:

$$Q = \frac{E\,(P_v - P_t) \times C}{G_f}$$

where:

Q = fluid produced per cycle, bbl.
E = fractional sweep efficiency

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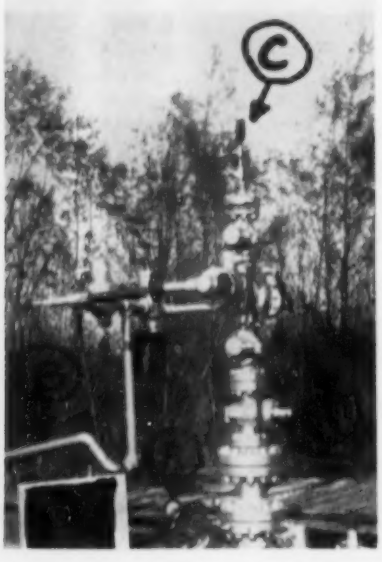
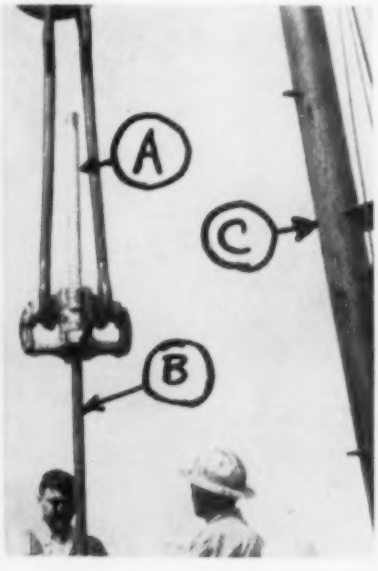
PRODUCING

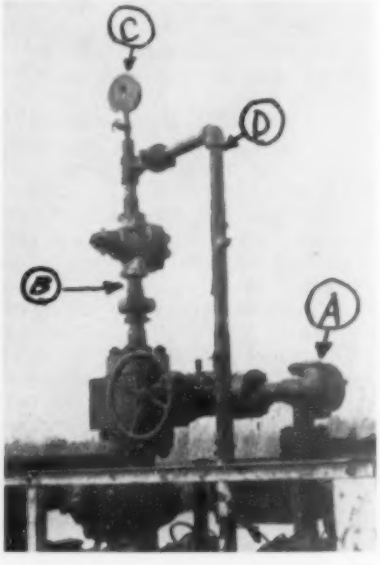
DUAL WELL has upper gas zone lifting lower oil zone. (See Fig. 6.) Casing pressure is about 3,000 psi. (A). Lower zone flow line has no choke (B). Tubing pressure is about 200 psi. (C).

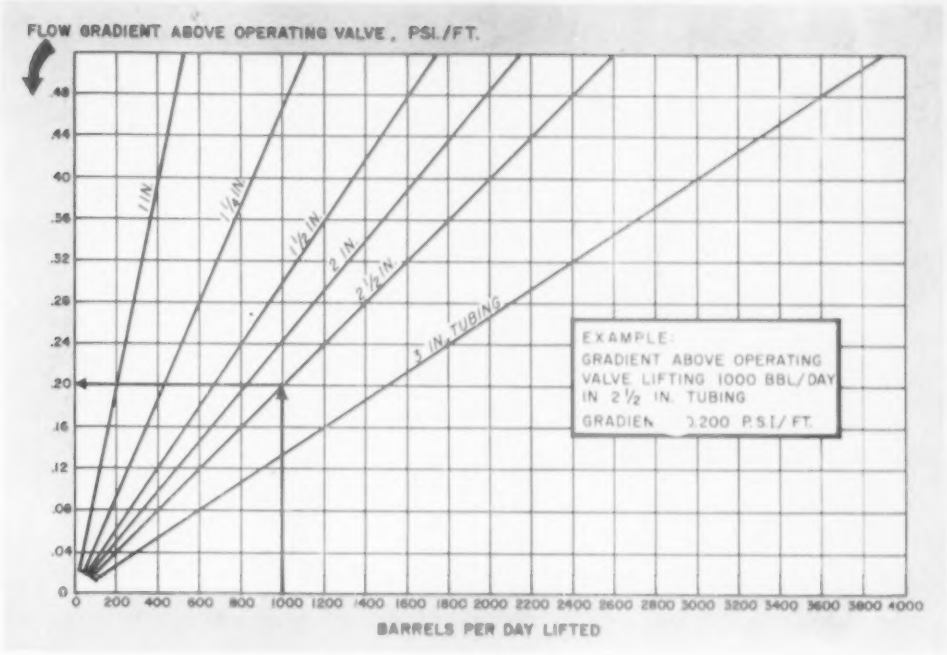


"CAPSULE" MANDREL containing fluid-operated valves goes into tubing. Mandrel (A) is mounted on 1½-in. plain macaroni tubing (B) as it is lowered into 2½-in. tubing by pulling unit (C).



CONCENTRIC STRING has fluid-operated valves on inner tubing. Inlet gas is choked (A) to common reservoir while macaroni tubing with hanger (B), gage (C), and flow line (D), carries production.





LIFTING RATES for various size tubing strings correlate with flow gradient above gas-lift valves as shown. Available gas pressure and depth of lift govern the gradients. Fig. 1.

P_v = valve opening pressure, psi.
P_b = back pressure at the surface, psi.
G_f = gradient of the dead fluid, psi. per ft.
C = constant for tubing volume, bbl. per ft.

The engineer considering gas-lift will find factors in the above-mentioned formula that are sometimes difficult to evaluate. However, results obtained from the method outlined have been found to be in reasonable agreement with observed results in hundreds of actual field tests with fluid-operated valves. For example, 450-psi. fluid-operated valves in a Texas Gulf Coast field were slug-lifting 787 bbl. of fluid per day, 4.6 bbl. per cycle, by injecting gas at 3,944 ft. in 2½-in. tubing against 50-psi. back pressure. With 92 per cent salt water the estimated fluid gradient was 0.457 psi. per ft. Substituting in the formula:

$$4.6 = \frac{E \times (450 - 50) \times 0.00579}{0.457}$$

$$E = 0.908 = 90.8 \text{ per cent}$$

No exacting sweep efficiencies have been determined but experience has shown them to be consistently in the 70 to 90 per cent range.

Since hydrostatic pressure is independent of tubing size, the same formula is applicable to macaroni tubing in slug-lifting operations. Observed results are in close agreement with the empirical formula used.

In a Louisiana Gulf Coast well, 550-psi. valves intermitted approximately 2 bbl. per cycle (90 per cent salt water) through 4,800 ft. of 1½-in. tubing against 75-psi. back pressure. Total production was approximately 340 bbl. of fluid per day. In a deep California well, 800-psi. valves slugged 14 bbl. per cycle through 3-in. tubing from an injection depth of 10,400 ft. Water content was 19 per cent. Total production was 42 bbl. per day of fluid. From these and many other actual field tests, evidence indicates that the friction factors involved have remained relatively constant. Because gas injection is controlled by the producing characteristics of the well and is coordinated with a **known** volume of fluid at each cycle, gas-fluid ratios are normally very low.

Continuous flow . . . If a well condition is such that the flowing bottom-hole pressure will feed past point of injection at a rate sufficient to maintain a pressure opposite the valve greater than the valve-opening pressure, the delivery of fluid from the flow string is constant. Fluid-operated valves thus achieve one-point injection at the maximum depth the available gas can enter the tubing string. It follows that wells may be efficiently lifted from greater depths because full available energy is used at the operating valve.

Pressure-gradient traverses for 2, 2½, and 3-in. tubing sizes have been made in flowing and gas-lift wells to determine "aerated" flow gradients for various rates of production. Fluid data from these tests have been compiled and resolved to numerous graphs for usage in designing gas-lift installations for constant-flow valves. Although most of the graphs are in relatively close agreement, wide ranges of actual continuous flow gradients are encountered, due to the many variables involved. The factors are normally used simply as a basic assumption in spacing valves for continuous flow.

The assumed gradient may or may not actually occur when the well is being lifted. Higher gradients are encountered in macaroni tubing lift, and the demand for production capacity must be reduced accordingly. Available gas pressure, tubing size, and depth of lift again are the primary considerations. These are some actual observed rates of production for various sizes of tubing and lift conditions:

2½-in. tubing—2,600 bbl. of fluid per day, lifting with 700-psi. gas.
2-in. tubing—1,700 bbl. of fluid per day, lifting with 700-psi. gas.
1½-in. tubing—700 bbl. of fluid per day, lifting with 800-psi. gas.
1¼-in. tubing—425 bbl. of fluid per day, lifting with 600-psi. gas.
1-in. tubing—200 bbl. of fluid per day, lifting with 500-psi. gas.

The preceding table of actual observed rates of production, gas-lifted by continuous flow with fluid-operated valves, gives an indication of the ranges of production that may be expected for the tubing sizes shown. The figures represent only observed production rates under certain conditions and should not be interpreted as being maximum production possible for these tubing sizes. The maximum rates that may be

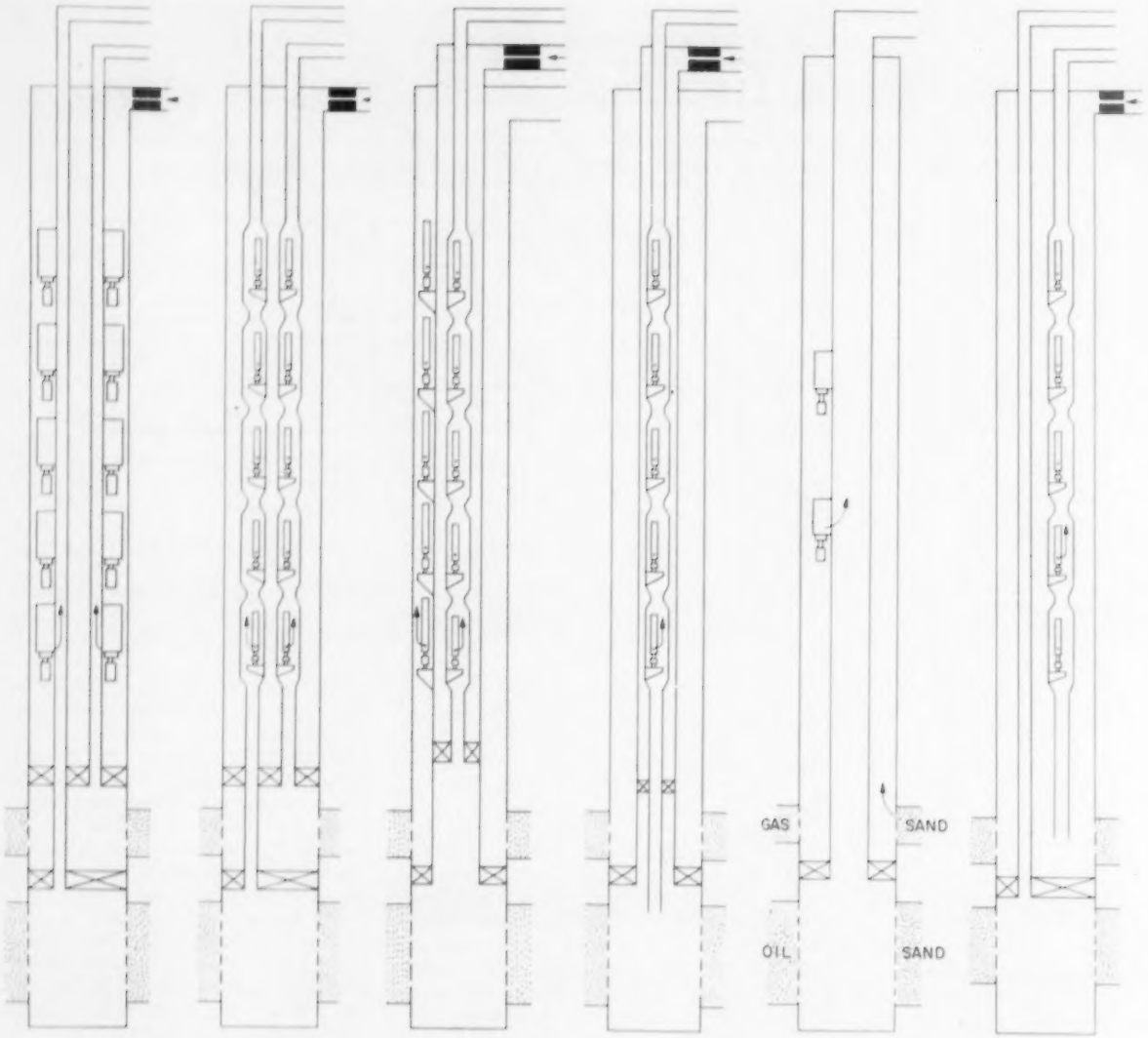


Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7

FLUID-OPERATED VALVES are mounted so that they will pass within the casing without hanging up. Valves may be mounted outside or inside the flow string. Each string of valves is controlled by the fluid within its own flow string and receives its gas supply from the common reservoir.

lifted depend primarily upon depth of lift, available gas pressure, and the friction factors involved in flow through tubing.

A combination of field production data with known gas-lift pressure and fluid-operated valve settings results in curves for evaluating flow inside tubing strings (Fig. 1). These curves may be used to assist the gas-lift engineer in placement of valves for continuous lift.

Common-Reservoir Systems

Common-reservoir gas lifting with fluid-operated valves readily adapts to both parallel and concentric tubing installations. The size of casing dictates the combinations of tubing sizes that may be installed. Because of this, the demand for production capacity should be considered previous to drilling the well. It is characteristic of the common-reservoir system, however, to make larger flow areas available. This increases fluid-recovery capacities from a given size hole.

Parallel strings . . . Parallel-tubing installations (Figs. 2 and 3) are being made where the hole size is adequate to install the size tubing which is capable of delivering the desired production. Where 7-in. or larger casing has been set, parallel strings of 2 or 2½-in.-tubing installations are possible. In 5½-in. casing, parallel 2-in. and 1¼-in. tubing or two 1½-in. strings may be installed.

Regardless of tubing selections made for parallel strings, the common-reservoir principle is adaptable by use of fluid-operated valves. Each string is equipped with fluid-operated valves mounted in such a manner that they will pass within the casing without hanging up. Each string of valves is controlled by the fluid within its own tubing and receives its gas supply from the common-reservoir annular space. Intercommunication of the zone fluids is prevented by reverse-flow check valves on each valve.

Concentric tubing . . . The common-reservoir gas lift is also very adaptable to wells where tubing strings are concentric (Fig. 4). Fluid-operated valves again lend their characteristics to advantage. For the casing-flow zone the valves are installed on the outside of

TABLE 1—PRODUCTION OF DUAL GULF COAST WELLS WITH ONE ZONE GAS-LIFTED USING FLUID-OPERATED VALVES

Concentric String. Gas-Lift Through Macaroni Inside 2½-In. Tubing. 7-In. Casing

Well No.:	Prod., bbl./day Oil	Water	Total	B.s. and w. per cent	Available gas (psi.)	Input gas M.c.f. per day	Cu. ft. per bbl.	Tubing press. (psi.)	Sep. press. (psi.)	Choke size (in.)	Depth perf. (ft.)	No. valves	Depth bottom valve (ft.)	Nominal tubing size (in.)
A	42	67	109	61	800	22	197	250	153	15/64	7,300	4	3,000	1½ plain
B	44	5	49	8	800	40	825	225	161	3/4	7,300	7	4,937	1¼ E.U.E.
C	62	251	313	80	800	87	279	150	100	3/4	8,100	7	4,753	1¼ E.U.E.
D	64	210	274	77	800	32	119	240	100	19/64	8,100	7	4,802	1¼ E.U.E.
E	52	176	228	77	800	35	153	350	100	15/64	8,100	7	4,938	1½ plain
F	24	66	90	73	800	55	605	305	139	12/64	8,500	7	5,023	1½ plain
G	65	200	265	75	700	93	350	250	50	14/64	6,319	4	3,915	1¼ plain

Concentric Strings. Gas-Lift Through Macaroni Inside 2-In. Tubing. 5½-In.

H	126	0	126	(*)	700	13	100	250	50	8/64	6,300	3	3,002	1 plain
I	13	250	363	97	700	91	250	60	50	Open	6,316	3	2,861	1¼ plain†
J	47	350	397	88	700	151	380	300	50	20/64	6,300	3	2,534	1¼ plain†

Single String. 5½-In. Casing

K	11	209	220	95	3,000	271	1,230	200	60	Open	8,800	2	4,515	2 in. E.U.E.

Parallel Strings. Gas-Lift Upper Zone. Two 2-In. Strings in 7-In. Casing

L	151	9	160	6	800	92	575	250	40	1/4	9,000	9	8,078	2 in. N.U.

*Produces 2 to 5 bbl. of sand per day. †Used turned-down couplings to run inside 2-in. tubing.

TABLE 2—PRODUCTION DATA ON DUAL WELLS WITH GAS-LIFTING OF TWO ZONES USING FLUID-OPERATED VALVES

Concentric Strings. Gas-Lift One Zone Through Macaroni, and Second Zone Through Tubing-Casing Annulus. 5½-in. Casing

Well No.:	Zone lifted	Prod., bbl./day Oil	Water	Total	B.s. and w. per cent	Available gas (psi.)	Input gas M.c.f. per day	Cu. ft. per bbl.	Tubing press. (psi.)	Sep. press. (psi.)	Choke size (in.)	Depth perf. (ft.)	No. valves	Depth bottom valve (ft.)	Nominal tubing size (in.)
A	Upper	35	465	500	93	700	396	792	315	50	26/64	6,500	3	2,730	2½-5½ annulus
	Lower	31	279	310	90	700	84	270	125	50	24/64	8,140	4	3,761	1¼ (in 2½-in.)
B	Upper	78	30	108	28	700	11	102	300	50	9/64	6,235	3	2,987	2½-5½ annulus
	Lower	56	35	91	28	700	5	55	400	50	7/64	6,276	3	3,005	¼ (in 2½)

Parallel Strings Clamped Together (Two 1½-In. Inside 5½-In. Casing)

C	Upper	48	192	240	*80	800	240	*1,000	100	40	Open	8,535	10	7,100	1½ E.U.E.
	Lower	58	232	290	*80	800	290	*1,000	100	40	Open	9,991	10	7,100	1½ E.U.E.
D	Upper	50	200	250	*80	800	250	*1,000	100	40	Open	8,501	10	7,100	1½ E.U.E.
	Lower	56	224	280	*80	800	280	*1,000	100	40	Open	9,992	10	7,100	1½ E.U.E.

*Approximate.

the regular tubing string. For the tubing zone, valves are installed on the small macaroni tubing which is hung inside of the regular tubing. Each string of valves is again exposed to the zone which they are to lift. They receive their gas supply from the tubing-macaroni annulus which serves as the common reservoir for the lifting gas.

Field cases . . . Table 1 shows production data on dual gas-lifted wells (lifting one zone) in Gulf Coast fields. Seven of the wells, A through G, have 2½-in. tubing in 7-in. casing with 1¼-in. E.U.E., or 1½-in. plain macaroni run inside the 2½-in. tubing. Fig. 5 is an example of an installation of this type.

Three of the wells, H, I, and J have 2-in. tubing in 5½-in. casing with 1-in. plain or 1¼-in. plain (turned-down couplings) macaroni run inside the 2-in. tubing.

Well K, illustrated in Fig. 6, is an example of an upper gas sand lifting a lower oil sand. Feed-in from the oil zone has been relatively low (220 bbl. of fluid per day) and the valves are slug-lifting, even with 3,000-psi. casing pressure. The valves close immediately after the fluid slug is delivered to the separator.

A parallel string installation, Well L, is illustrated in Fig. 7. This well is slug-lifting. Since no upper packer was used, approximately 1,000 ft. of tubing was hung below the bottom valve to allow fluid in the annulus to serve as a seal between the gas and the open-ended tubing.

Table 2 shows production data on dual gas-lifted wells (lifting both zones) in the Gulf Coast and Mid-Continent areas. Two of the wells, A and B, have concentric strings with 1¼-in. macaroni inside 2½-in. tubing. The casings are 5½-in. For the lower zone (produced through the macaroni) 2½-in. capsules are used; and, for the upper zone (produced through the 2½-5½ annulus), intermitting-type mandrels are used with fluid-operated valves installed for casing flow. Gas for both zones is provided by a common gas reservoir in the macaroni-tubing annulus.

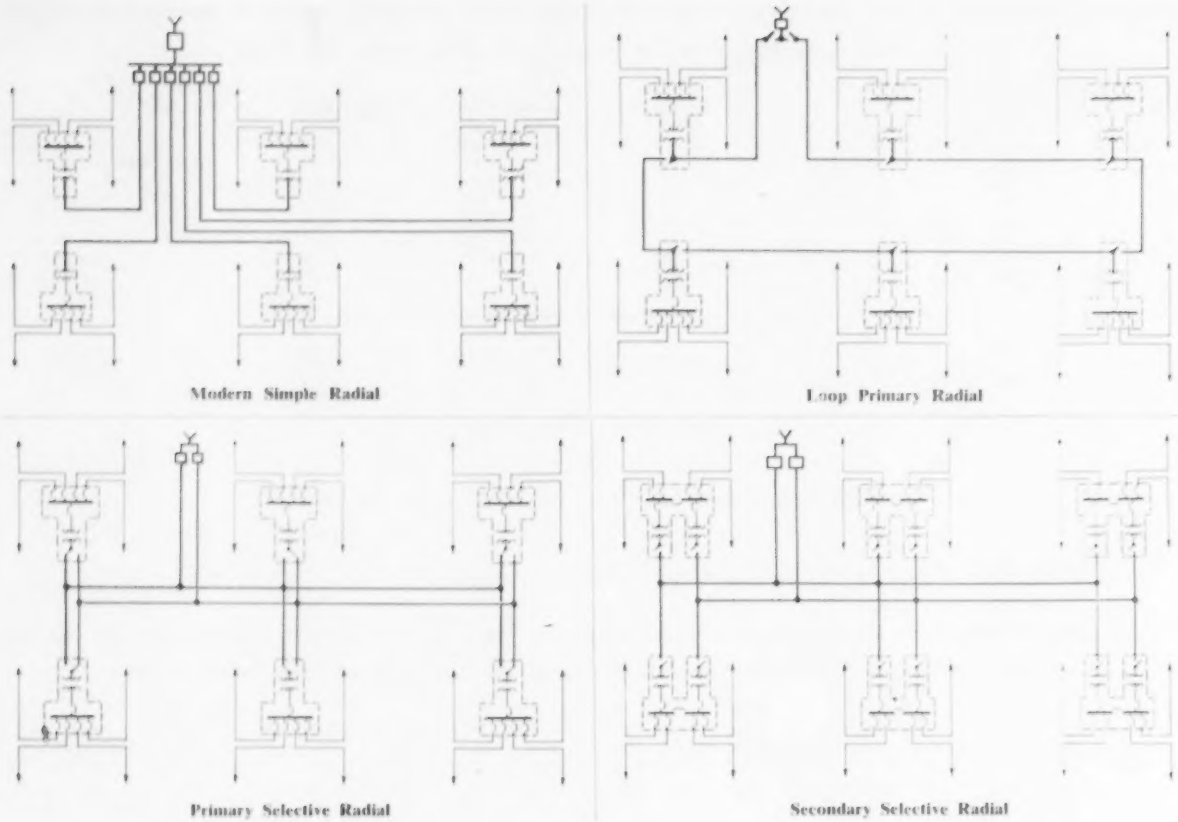
Wells C and D are parallel string installations with two strings of 1½-in. E.U.E. macaroni run inside 5½-in. casing. The strings of macaroni were clamped together. Regular outside-mounted mandrels were used in both wells.

Acknowledgment

The assistance and cooperation of field personnel and oil operators in gathering well data for the preparation of this report is gratefully acknowledged.

Reference

1. "The Fluid-Operated Valve," William B. Adair, The Oil and Gas Journal, February 14, 1955.



THE FOUR BASIC SYSTEMS for distribution of electrical power to the refinery. Fig. 1.

Here's what to consider in designing

Electrical Power Systems for Refineries

There's more to explore than meets the eye, as this author points out

by George R. Dunbar

THE major factors to consider when designing an electrical distribution system for a refinery are the type of system, the substation voltages and bussing arrangement, the type of grounding, and methods of relaying.

A variation in initial cost exists between the various recognized distribution systems applicable for refineries. Caution should be taken not to select the least-expensive system unless it will actually give the best over-all results when considering all factors. Flexibility, service continuity, regulation, efficiency, and operating and maintenance costs are other important factors that must be weighed in choosing the system.

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The primary service can range from 12 to 69 kv. but the selection of this voltage is dependent upon the voltage available from the utility and rate structure. The tendency in newer refineries of higher capacity and greater physical size is to use nominal 15-kv. substation voltage. This has advantages of higher cable loading for a given voltage drop at the point of utilization. However, the cost of transformation, control, and motors at 15 kv. is considerably higher.

Four Systems

There are four basic distribution systems considered pertinent to the petroleum refinery. One or more of the features of each of these systems are frequently combined but generally speaking the modern simple radial, loop, primary-selective, or secondary-selective systems receive the greatest application. A typical single line of each of these systems is shown in Fig. 1.

Modern simple radial . . . This is probably the best-known system used in industrial plant distribution. Each feeder is connected to the substation bus through a circuit breaker. Since the entire plant is fed through a single substation bus, full advantage can be made of diversity between load centers taken directly off this bus. This permits the use of minimum amount of substation transformer capacity.

However, all the power is distributed

at utilization voltage from one point, thereby rendering the system voltage regulation and efficiency only fair. Service continuity and flexibility are poor since there is no way to isolate the substation bus. The most redeeming feature of this system is its low initial investment and low operational and maintenance cost.

Loop . . . The loop system is similar in principle to the modern simple radial. It provides for quick restoration of service when a primary fault occurs and is low in initial investment and low in operational and maintenance cost. Flexibility, efficiency, and service continuity on the other hand are improved with this system over the radial since it provides sectionalizing of portions of the loop.

If circuit breakers are used in the loop instead of disconnecting switches, the initial investment is increased. However, a greater degree of service continuity is gained because relaying of the faulted section is possible thereby keeping outage time to a minimum. Regulation with this system is poor for the same reason as for the radial system.

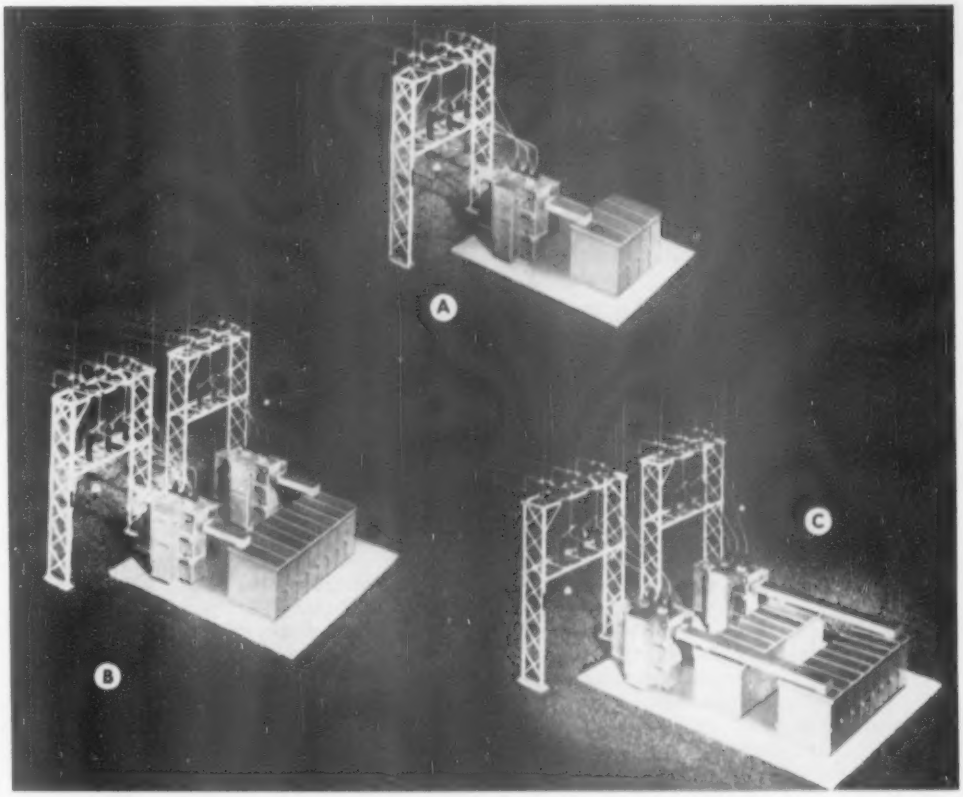
Primary-selective . . . This system differs from the two previously described in that it uses at least two primary feeders to each power center. The system is designed so that when one primary feeder is out of service, selector switches at each power center can be switched over to the energized feeder to carry the total load.

The initial investment of the primary-selective system is only slightly more than either the radial or loop system but because of the easy restoration of primary service, system continuity is improved considerably. Flexibility, regulation, and operating and maintenance costs are equivalent to that of the loop system.

Secondary-selective . . . This system makes use of the same principle employed in the primary selective by using a duplicate feed from the main source. However, duplication of supply source is carried down to the secondaries of the transformers. This arrangement permits immediate restoration of service to all secondary loads upon failure of a primary feeder if automatic-transfer equipment is used on the low-voltage equipment.

For this reason the service continuity factor is good with this system. In order to utilize the feature fully, each transformer must be capable of handling its own load requirements as well as a predetermined part of its companion unit. Since this requires additional capacity per transformer, the initial investment is considerably higher than any of the previous systems discussed.

Flexibility and operation and maintenance costs are the same for this system as the others, but, because of the additional capacity required in each transformer, regulation is improved.



TYPICAL COORDINATED UNIT substation arrangements for refinery use. Fig. 2.

Substation Voltages and Bussing Arrangements

Any of these systems can be arranged as standard metal-clad switchgear equipment. In fact, metal-clad switchgear is becoming standardized as the type of construction used for substation distribution equipment whether it be applied indoor or outdoor.

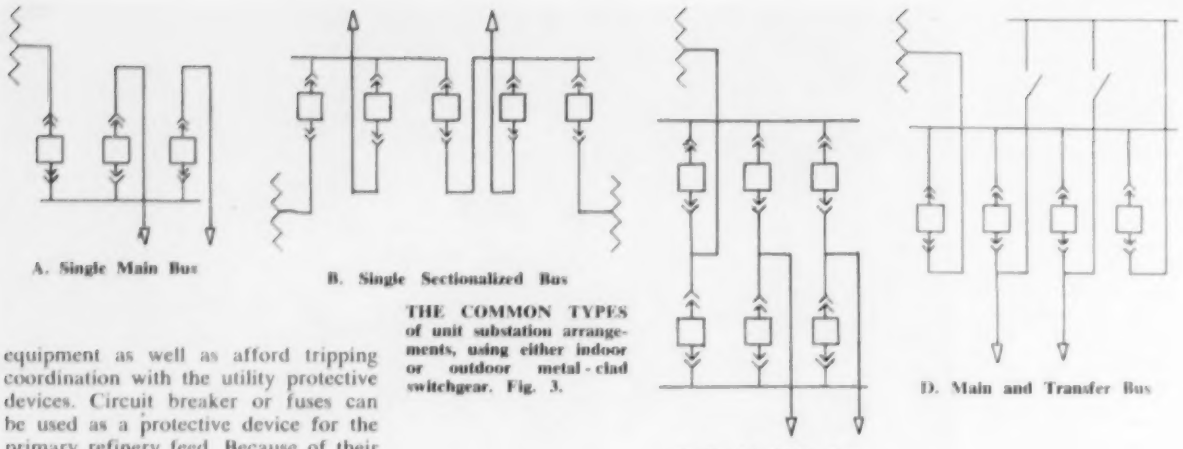
The main substation consists of one or more transformer banks and secondary switching equipment for distribution of the electrical load. For purposes of this paper, only three-phase transformers connected by means of enclosed bus run or throat to secondary metal-clad switchgear will be considered. Whether indoor or outdoor switchgear be used is primarily a matter of economics and maintenance ease.

The general arrangements are equally applicable for outdoor and indoor construction. The cost and availability of indoor space must be weighed against the added cost of outdoor switchgear to determine which arrangement is more economical.

The decreased availability of outdoor switchgear for maintenance during bad weather sometimes merits the consideration of flexible arrangements such as double main bus or main-transfer bus.

Primary source . . . The primary three-phase source to the refinery from the utility may vary from 69 to 12 kv. For added reliability a double feed can be brought in from a separate supply line or load can be served from a loop system. The primary source can best be terminated on a high-voltage steel structure and primary revenue-metering facilities are made available at this point.

Primary switches as well as overload and short-circuit protection must be provided by the user to protect his



A. Single Main Bus

B. Single Sectionalized Bus

C. Double Main Bus

D. Main and Transfer Bus

THE COMMON TYPES of unit substation arrangements, using either indoor or outdoor metal-clad switchgear. Fig. 3.

equipment as well as afford tripping coordination with the utility protective devices. Circuit breaker or fuses can be used as a protective device for the primary refinery feed. Because of their greater reliability, greater ease of coordination by use of relays, and restoration of service, circuit breakers are more desirable than fuses. Typical coordinated-unit substation arrangements are shown in Fig. 2.

Metal-clad switchgear for voltages from 2,400 to 15,000 volts represents the most reliable construction available for substation distribution equipment being fed from a common bus. Draw-out breakers, insulated bus, and individual steel compartmented sections add to the safety and reliability of this type of equipment. Nevertheless, different available arrangements of bus and connections provide different degrees of service continuity, flexibility, safety, and cost.

The common types of unit substation arrangements using either indoor or outdoor metal-clad switchgear are the single main bus, single sectionalized bus, double main bus, and main and transfer bus. An example of each of these arrangements is shown in Fig. 3.

Characteristic of older refineries is the use of a primary feeder voltage of 2,400 volts. This voltage has many advantages providing it can be made available at the point of application without undue expense and the risk of poor regulation. At 2,400 volts, savings can be realized in the cost of motors and control since this is the utilization voltage for them. Also, 2,400-volt primary feeder voltage represents only one transformation down to a utilization voltage of 480 volts or 120/208 volts.

For area loads in excess of 10,000 kva., 2,400-volt distribution involves use of too many circuits because circuit loading is limited and nominal 15 kv. is justifiable. Likewise, where lines are long, greater permissible circuit loading within voltage-drop limits is available with 15 kv.

In corrosive atmospheres, oil circuit breakers are used for protection of contacts and moving parts which are immersed in oil. The general tendency is to remove the substation switchgear sufficiently far from the process areas so that corrosive fumes are not a factor in the type of circuit breaker used.

In those cases, air circuit breakers are most frequently used because of ease of maintenance and the oil handling problem is eliminated. The cost of a given air circuit breaker is the same as a similarly rated oil unit.

Single main bus . . . By far the most widely used substation bussing arrangement is the single main bus. This is the simplest from an operating and relaying standpoint and likewise is the least expensive of the four bussing arrangements discussed herein. The complete substation however, relies upon the reliability of the main bus.

Insulated metal-clad-switchgear bus construction is such that faults within it are extremely unlikely. If the substation is incapacitated because of a shutdown, provision should be made that each load can be fed from more than one source such as from a separate substation. This arrangement has advantages since it does not have complicated auxiliary apparatus and detailed operating procedure is not required.

Single sectionalized bus . . . The essential difference between this arrangement and the single main bus previously described is the ability to sectionalize the bus by means of a main breaker. The cost of the sectionalized bus is increased by the addition of a main and tie circuit breaker and an additional power source. The tie breaker is operated normally open and is closed in the event of failure of the primary source.

Under these conditions the load on the faulted side can be maintained by the unaffected power source. This is the same condition as the secondary-selective system previously discussed. The over-all cost of this arrangement compared to the single main-bus scheme is approximately 130 per cent greater.

Double main bus . . . A growing use for a double main bus in refinery electrical distribution has arisen in recent years. The justification of this arrangement is for feeding such critical loads that not even momentary outages can be tolerated. This arrangement permits transfer of a load to another feeder breaker without dropping the load. The cost of this arrangement as opposed to the single main-bus scheme is slightly greater than 200 per cent because of the double apparatus and additional relaying equipment frequently deemed desirable.

Although this scheme is costly, its operation is simple and straightforward. All switching is done with breakers. To somewhat reduce the cost of the initial installation provisions only for breakers can be supplied in one lineup and a spare breaker be used when a feeder is to be transferred. Under these circumstances more care must be taken when a load is transferred from on bus to another.

The two switchgear lineups are separate and can be connected together by means of cable or overhead bus. Since the connection between the two sections is generally short, integrity of the system is not materially jeopardized by using cable and the cost is lessened.

Main-transfer bus . . . This arrangement offers reliability between that of the double main bus and the single main bus. Although this scheme employs two busses, main and transfer, they are both within the same switchgear lineup and are isolated by means of compartments. However, the integrity of each bus is not as high as two busses in separate lineups. The feature which permits the removal of any given feeder circuit breaker without

disturbing feed to that particular load is available with this scheme as in the double main-bus scheme.

The transfer-bus disconnecting switch for a given feeder is closed before the circuit breaker normally feeding that load is tripped. The breaker can then be removed and service is maintained to the load through the disconnect switch. To restore that breaker back into the circuit the procedure is simply reversed, keeping the disconnecting switch closed until the feeder circuit breaker is again closed.

It is sometimes recommended that a main and transfer-bus tie breaker be used to act as feeder backup protection when the given load is receiving power through the disconnecting switch. Further, this tie breaker can be used as a safety device to prohibit the breaking of any load current when a disconnecting switch is open after a feeder breaker is put back into service.

The operational procedure of the main and transfer-bus arrangement is more complicated than that of any of the previous three systems. Its relative cost compared to that of a single main-bus system is approximately 160 per cent.

One advantage of this scheme over the double main-bus scheme is the reduction in over-all floor space required. The main and transfer-bus arrangement requires an extra high unit to accommodate the transfer bus and to house the disconnecting switches. A saving of about 40 per cent floor space can be realized with this arrangement over the double main bus.

In selecting the substation bussing arrangement, care should be taken that the operating procedure does not become so complicated that safety is sacrificed. If disconnecting switches or other bypass arrangements are used, interlocking should be provided to prohibit operating these devices under load conditions, unless the switches are so designed.

System Grounding

Advantages from both grounded and ungrounded systems can be obtained but the criteria which determines the use of a particular system depends mostly on operating personnel and the continuity of the process. These two factors will be brought into clearer focus as the two types of systems are described.

If adequate detecting facilities and trained maintenance personnel are available, rapid removal of ground faults on an ungrounded system will assure a minimum number of circuit interruptions and less total outage time. The criterion for this is the speed with which the initial ground fault is removed. But if it is acceptable to trip the affected feeder immediately on a ground fault, the grounded system can be used and the problem of overvoltages is materially minimized.

Grounded systems . . . When a phase-to-ground fault occurs on a grounded system, the affected feeder circuit breaker trips out immediately. Further, under ground fault conditions, a grounded system will hold the line-to-neutral voltage to not more than twice the normal system line-to-line potential. Although the circuit is immediately interrupted under such conditions, it is felt by many that the system insulation is not as overstressed as it may be under similar conditions with an ungrounded system.

Theoretically, transient overvoltages in the neighborhood of five to six times normal voltage to ground are available on an ungrounded system. However, overvoltages due to lightning, switching surges, or physical contact with higher voltage systems can be experienced by both grounded and ungrounded systems. The severity to either system under any of the previously mentioned conditions is not materially different.

Some contend a grounded system adds a measure of safety to operating personnel. Certainly on systems 480 volts above, safety hazard of these line-to-neutral voltages is no less than the line-to-line voltages. Possibly a false security is gained on an ungrounded circuit with the feeling that one phase-to-ground contact can be made safely. This thought is immediately dispelled on the grounded system and greater caution will therefore be exercised by operating personnel promoting greater safety.

The fact that a faulty circuit is immediately detected on a grounded system is only part of the story. When essential loads of continuous nature are being fed, an alternate feed must immediately be made available or an outage of that particular process will occur. And even though a ground will not cause tripping on an ungrounded system, a second ground is more likely to occur after the first ground because of higher insulation stress on the ungrounded phases.

Nevertheless, the operating personnel are required to locate and remove the grounded condition in either system with the same vigor. The primary difference in maintenance time is that the faulted feeder is more easily located on the grounded system.

Ungrounded systems . . . On an ungrounded wye system, contact of one phase to ground will not cause immediate tripping. When this occurs however, the remaining two-phase voltages are raised to line-to-line value. Because of these sustained overvoltages and transient overvoltages previously discussed, insulation of equipment can be weakened.

The persistence of overvoltages on insulation will cause eventual breakdown. Therefore, proper ground indication for effective location of the ground fault and prompt removal of same are absolutely necessary to enjoy the advantage of circuit continuity.

If a phase to ground fault on an ungrounded system were ignored, a greater risk of an outage exists than before the first fault occurred. As soon as a second line-to-ground fault occurs, effectively a line-to-line fault is established through the ground connections, and breaker tripping takes place. If both line-to-ground faults occur on different phases on the same feeder, only that feeder breakers will trip. If, however, two feeder circuits are affected, both feeder breakers will trip out.

A study of comparative annual circuit outage for grounded and ungrounded systems shows that prompt location and removal of grounds on the ungrounded system directly improves its service continuity relative to a grounded system serving the same load. Therefore, it is concluded that proper maintenance and rapid fault location to promptly remove the initial line-to-ground fault are necessary to get maximum advantage from an ungrounded system.

An advantage of the ungrounded system is that it is less expensive than a grounded system. The total amount of saving on an initial total cost basis however, is not appreciable. Until recent years, practically all refinery distribution systems were ungrounded. Grounding of these systems using existing equipment can be considerably more expensive unless a neutral point is readily available.

If in modernizing a refinery distribution system, a grounded system may be considered desirable, it is important to consider the operating personnel who may have been operating many years with an ungrounded system. A gradual transition to the grounded system is then advisable to condition them for the change in procedure. All new equipment should have neutral points included to facilitate their grounding as the transition from one system to another takes place.

System Relaying

There is a growing need for more effective relaying on refinery electrical distribution systems. As units become larger and systems increase in amount of equipment, it is necessary to protect them more adequately. Further, to insure maximum service to critical loads,

selective relay coordination must guarantee tripping of the faulted section without affecting the remaining load. Dependable, fast, and trouble-free relaying systems are required to promote better protection and service continuity.

High speed, sensitive relaying is required on those parts of the system where extensive damage to equipment and system can occur if faults are not immediately removed or where the investment in apparatus is sizable to justify more adequate protection. Differential relays meet the sensitive high speed requirements and are usually employed for busses and large transformer protection. Induction disk overcurrent relays are standard for general feeders while thermal-type of relays are better for protecting apparatus such as motors and transformers. These relays function to operate one or more circuit breakers to clear the circuit.

Bus Protection

Busses, whether installed on outdoor steel structures or enclosed in metal, are fairly trouble free. When a fault does occur in a bus, it is in a part of the system that can cause tremendous damage to other equipment as well as jeopardizing the system itself. For this reason, bus faults must be cleared by the fastest and most sensitive method. Generally acceptable to perform this protection is differential relayings.

The percentage-differential relay operates on the zone principle so that any disturbance within the prescribed zone which causes a difference in output current from the zone from that entering, causes immediate tripping.

For this reason the differential relay is particularly sensitive and can operate in only a few cycles. Care must be taken to select differential relays which will not trip during current transformer saturation on high short-circuit currents.

The variable percentage-differential relay (very sensitive for small fault currents, less sensitive for large currents) is used to prevent faulty tripping on external faults. Linear couplers, which are air-core current transformers, in each circuit entering or leaving the bus give the highest speed protection (1.25 to 1.75 cycles) and cannot saturate as do conventional iron-core current transformers.

The secondaries of the linear couplers are connected in series and their respective voltage output is directly proportional to their primary current. As long as the sum of the currents into the bus is zero, the resultant output voltage is zero. As soon as the bus currents are disturbed by an internal fault, a proportional voltage occurs. This voltage can operate on a voltage-sensitive relay, tripping the breakers involved.

Any compromise of bus differential protection to save on initial investment jeopardizes the integrity of the bus such as modification to overcurrent protection which is considerably slower and not nearly as sensitive.

Feeder Protection

Probably the greatest application of overcurrent relays is that for feeder protection. The standard induction disk type of overcurrent relay with instantaneous tripping attachments is all that is required in the vast majority of cases for protection of the ordinary feeder.

A popular connection for grounded systems is one which uses two phase overcurrent relays and one residual ground relay. Since the standard complement of overcurrent relays on a metal-clad switchgear section is three, such use of these relays gives adequate phase and ground protection. Of course, three current transformers are required if this arrangement is to be properly employed.

Occasionally directional overcurrent relays are required where there is a possibility of feedback from the load due to generation or from synchronous motors. A more sensitive method of detecting this feedback can be obtained with directional overcurrents than by overcurrent relays.

Directional relays always are needed where a bus is fed from two sources of power, as in a loop system, to prevent losing both sources for a fault on one of them. In this case, the current is the same in each breaker and directional relays are necessary to select the breaker which should trip.

Transformer Protection

By far the most adequate overload protection of a transformer is a device that measures not only the overcurrent flowing in the transformer windings but also is sensitive to the temperature of the oil. Such a device is a temperature overload relay and is in general use for starting cooling fans, sounding alarms, and tripping circuit breakers. Each function it performs is done at a predetermined temperature value.

Transformer protection from the line side is usually in the form of induction overcurrent relays for tripping the primary circuit breaker or fuses. Fuses are used for short-circuit protection only since their tripping characteristics have virtually no inverse characteristic to give overload protection. When a transformer is large enough, 5,000 kva. or larger, the investment in apparatus is sufficient to justify a higher degree of protection and differential relays can be justified.

Where extremely high-speed transformer relays are used care must be taken to insure that the transformer inrush current does not cause tripping. Differential relays are normally applied to trip both primary and secondary breakers.

In the event of a fault within the transformer, a recently developed device called the sudden-pressure relay is available to operate on a sudden increase of pressure within the tank. This relay is particularly good for this application since it is sensitive to rate of rise of pressure and not just the value of pressure as the ordinary relief diaphragm.

Motor Protection

Although there are many recognized ways to protect motors most unanimous agreement exists in the use of a thermal sensing element as opposed to an induction element. The reason for this is that a thermal element more closely follows the heating characteristics of the motor both on cold and warm start conditions. The induction-disk relay can approximate the heating curve of a motor starting cold, but it has no compensation when the motor is already heated.

A common arrangement which is well received on large motors is the use of two thermal overload relays on two of the phases and a long-time overcurrent relay on the third phase. Any such arrangement of thermal and induction relays generally makes use of circuit breakers.

In a Division 1 hazardous location, the use of fuses and contactors for motor protection is limited to application under oil or in special explosion-proof enclosures. The use of circuit breakers either oil or air, in a hazardous location is prohibited since explosion-proof metal-clad switchgear is not available.

Standard protection for motors in a refinery includes undervoltage relaying which trips the motor feed or breaker. A time-delay feature should be incorporated with the undervoltage element to permit riding overvoltage fluctuations temporary in nature and trip out only on sustained undervoltage which would cause ultimate damage to the motor.

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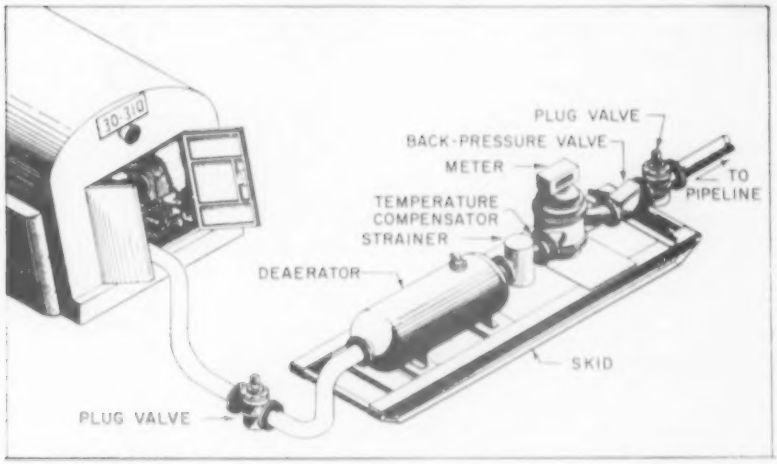
After 4 years' experience with them in crude-oil measuring, Interstate concludes . . .



FOR UNLOADING TRUCKS, a positive-displacement meter installed in this manner is giving good measurement. About 10,000 bbl. of oil per day from trucks is being measured at eight locations. Fig. 1.

P. D. Meters Get the Job Done

Use of p.d. meters is a sound and reliable practice for crude-oil measurements as far as Interstate Oil Pipe Line is concerned. Often they can be justified on increased accuracy of measurements alone. In other cases reduced tankage, elimination of evaporation losses, and lower labor costs will distinctly favor meters. Contrary to early beliefs, maintenance of meters in crude-oil service has not been excessive.

by Dee C. McKinley
Interstate Oil Pipe Line Co.

FOUR years of experience with positive-displacement (p.d.) meters in Interstate Oil Pipe Line Co.'s operations have demonstrated beyond a doubt the reliability and accuracy of this type of measurement facility. Fluids with a wide range of characteristics such as gravity, viscosity, wax content, and Reid vapor pressure have been successfully measured at terminals, at the production lease, and from transport trucks.

Over 140,000,000 bbl. of crude oil have been metered at terminals with a highly satisfactory maintenance and operating experience record.

For the most part our experience has revealed that the frequently mentioned obstacles to crude-oil meter operation are imaginary. Actually, our meter-performance data and maintenance experience indicate to us that crude oil is a more suitable medium for meter measurement than almost any other fluid.

Selection of Meters

Our experience reflects the most significant factors in selecting meters are the meter characteristics and manufacturer's attitudes as follows:

1. A flat characteristic curve over the expected operating flow range.
2. Low head loss across the meter at the maximum flow rate.
3. Clearance of sufficient magnitude to accommodate highest viscosity fluid expected.
4. Temperature compensation.
5. Over-all simplicity of mechanism.
6. Cooperation and service available from the meter manufacturer.

Our approach to the selection problem was to contact several manufacturers by letter, stating as clearly and concisely as possible existing operating conditions and fluid characteristics. It also was considered important to advise in the original contact that p.d. metering was not currently used in our operation, thus indicating an open mind with respect to types of meters or manufacturers.

We feel that this appoach was very beneficial since actually the type of meter selected and subsequently proved very satisfactory was not the type advocated by the planning personnel.

To prevent confusion to operating and maintenance personnel and to simplify meter introduction we decided not to experiment among meter types and makes until a substantial number of personnel were familiar with the principles of meter measurement. Experience has proved that our theory is correct.

Of the many types of p.d. meters available commercially, perhaps the most promising for use in oil pipeline service are as follows:

1. The sliding vane.
2. The lobed impeller.
3. The rotary bucket.
4. The oscillating piston.

Our successful experience has been with the sliding vane type; however, we are aware of the advantages offered by the other types.

Commercially available p.d. meters by pipe size and approximate maximum capacity are listed for the convenience of those interested as follows:

Pipe size (in.)	Approx. max. capacity bbl. per hour
2	170
2½	340
3	500
4	715
6	1,070
8	1,800
10	2,800

Note: Larger sizes up to 10,000 bbl. per hour are under development and will be tested in 1956.

Installation

In general the piping arrangements for p.d. meters in oil pipeline service

should follow the established patterns used in product pipeline installations or as outlined in A.S.M.E.-A.P.I. Code 1101. There are, of course, special service installations which require individual consideration.

For convenience in discussing our installations, they have been classified as facilities for:

1. Measuring oil transported by truck.
2. Measuring oil from lease tankage.
3. Measuring trunk-line movements.

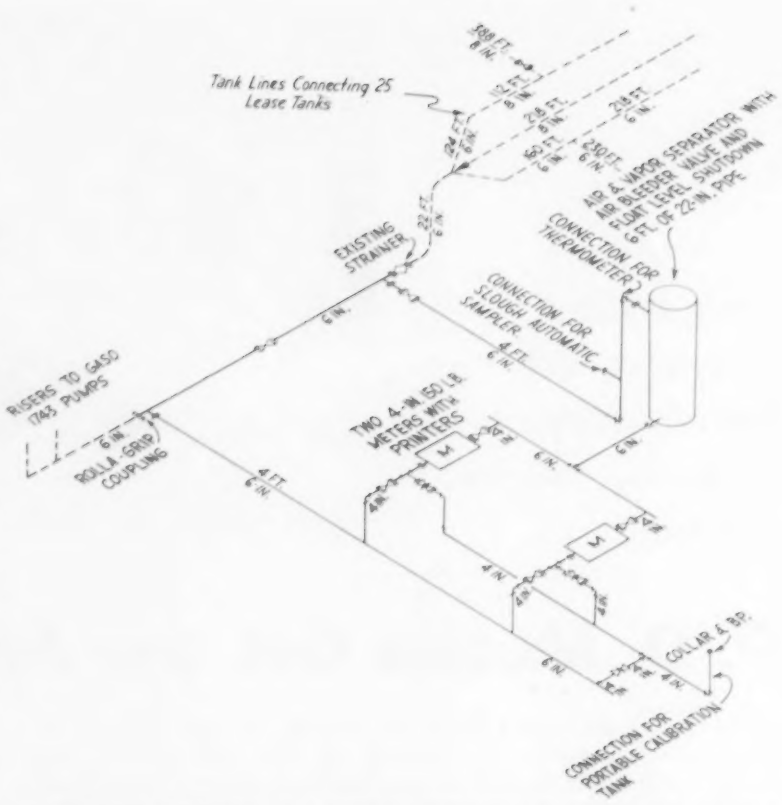
To successfully meter oil transported by truck our experience has led us to the equipment arrangement shown in Fig. 1. The auxiliary items of importance are the deareator, strainer, and back-pressure valve. In recent installations we have added a pipeline type of sampler to obtain a representative sample from which a b.s. and w. determination can be made. The conventional type of 20-bbl. volumetric prover tank (not shown in Fig. 1) is used to calibrate the meters. In one installation selsyn type of transmission is used to print tickets in the station office some 500 ft. removed from the meter location.

About 10,000 bbl. per day of oil that is transported by truck is being measured by p.d. meters at about eight different locations. Of this quantity 4,000 bbl. per day is on a custody-transfer basis.

Measuring oil from lease tankage . . . The arrangement of equipment for measuring oil from lease tanks is shown schematically in Fig. 2. The auxiliary equipment in this example is an air and vapor separator, liquid-level control, automatic pipeline sampler, strainer and in-line thermometers. The conventional volumetric prover tank was used for calibrating the meters. The meters are located between the lease tanks and the pipeline pumps.

At this location a 3 months' test was made to compare the meter measurement with the lease-tank measurement. Approximately 870,000 bbl. were measured with a net result of .02 per cent less volume by meter than by tank measurements. There are no custody-transfer measurements being made from lease tanks now. However, plans are well advanced and this type of installation will soon be used in our operations.

Measuring trunk-line movements . . . A schematic piping arrangement of a trunk-line meter-delivery terminal is shown in Fig. 3. At this location there are 10 meters each rated at 68,000 bbl. per day measuring three streams totaling about 260,000 bbl. per day. The meters are so arranged that the streams are measured independently for dispatching control. Two of the three streams are then blended together immediately after being metered.


Tank Lines Connecting 25 Lease Tanks
EXISTING STRAINER
CONNECTION FOR THERMOMETER
CONNECTION FOR SLOUGH AUTOMATIC SAMPLER
RISERS TO GASO 1743 PUMPS
ROLLA GRIP COUPLING
TWO 4-IN. 150 LB. METERS WITH PRINTERS
COLLAR & BP.
CONNECTION FOR PORTABLE CALIBRATION TANK

FOR LEASE MEASUREMENT, p. d. meters use air and vapor separator, liquid-level control, automatic sampler, strainer and in-line thermometers. Fig. 2.

A master meter and a volumetric type of prover tank are connected so that any meter can be calibrated by either the master-meter or prover-tank method. The prover tank has a 300-bbl. rated capacity and is of an unconventional size and design. A description and discussion of the tank will be given in detail later.

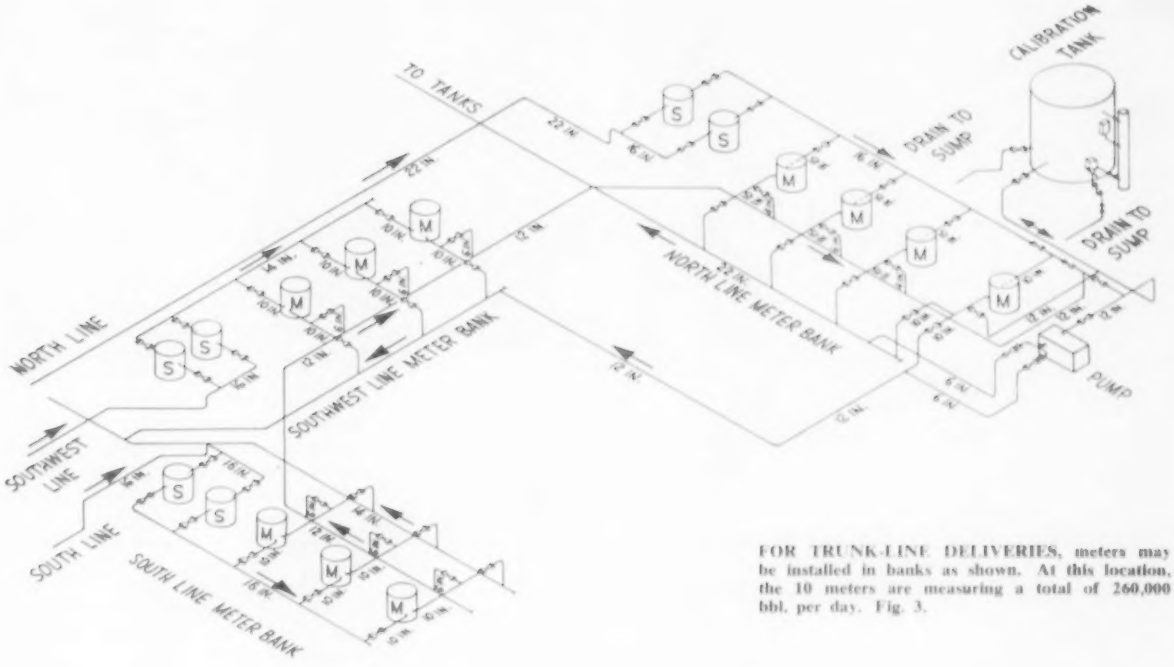
The conventional strainers with ¼ in. mesh screens and drain-line provision have been made; likewise, the calibration tank pump is a conventional type. Twin discharge lines from both the master meter and the pump are provided to divert the oil used for calibration purposes back to the proper stream. Samples are automatically withdrawn from side streams which are circulated through the nearby sample room.

A point of importance in designing an installation of this type is to arrange the piping so that all drainage and sump pumpings will be returned to the system on the same side of the meters as that from which they came. In effect this dictates that the sump discharge should connect to the downstream side of the meters since the oil drained from the calibration tank must be returned to the downstream side of the meters from whence it came.

At this and a nearby installation approximately 140,000,000 bbl. of crude oil have been successfully measured through p.d. meters. Accuracies are considered better than those previously obtained by the tank-gaging method. There have been no meter failures or shutdowns caused by meter operation. Complete confidence and reliance in the facility prevails from the operators through top management. Performance and maintenance experience at this lo-

THE AUTHOR

Dee C. McKinley has been senior oil-measurements engineer for Interstate Oil Pipe Line Co. for the past 4 years. He currently represents Interstate on A.P.I. and other industry committees concerned with the measurement of hydrocarbons. The introduction and adaptation of p.d. meters into crude-oil service has been one of his chief responsibilities. He had his first p.d. meter experience as meter foreman for a products pipeline company in 1941. In 1939 he received his B.S. degree in Mechanical Engineering from University of Oklahoma. He was employed as petroleum engineer in Venezuela for 2 years. He served 3½ years with the U.S. Army Corps of Engineers before joining Interstate in 1946. Paper presented at A.S.M.E. petroleum mechanical engineering conference in Dallas, September 24 to 26, 1956.



FOR TRUNK-LINE DELIVERIES, meters may be installed in banks as shown. At this location, the 10 meters are measuring a total of 260,000 bbl. per day. Fig. 3.

cation will be given later in this article.

Other trunk-line meter installations employing 4-in. meters have proved successful. At one such location we are receiving custody-transfer oil on a meter-measuring basis. This and other successful meter experience assures us that p.d. meters for trunk-line service are a practicable and desirable method of measurement in trunk-line operations.

There are no doubt several improvements which could be made to the installations just described. However, since they have served successfully for the purposes intended, they have been given exactly as they exist as arrangements which are practical.

Calibration Facilities and Procedure

There is considerable concern in the industry relative to the problem of accurately calibrating meters operating on crude oil. This concern is justifiable since it is a recognized fact that meter-measurement accuracies, regardless of service, are dependent equally on meter performance and calibration accuracy.

The most common concern expressed in connection with oil-meter proving is the wax and foreign material that may be deposited in the proving facility. Some believe that gravimetric proving is the proper solution to this problem. It may well be, especially under abnormal climatic conditions or on certain oils with extreme characteristics.

However, we have not found this problem as serious as often reported. After thoroughly considering the advantages and disadvantages of gravimetric and volumetric proving methods, we have installed only volumetric provers. In our opinion the chief disadvantages of gravimetric proving are the problems of accurate specific-gravity determination, limit to prover capacity, cost of facility, and more complicated determinations for operators.

Conventional types . . . The conventional types of tanks were selected for our first installations, and by controlling the operating procedure we have successfully prevented serious trouble from the deposition problem.

On one installation, handling wax oil transported by truck requires a frequent flushing of the tank. Fortunately, considerable condensate which provides a very effective cleaning medium is trucked to the same location.

At trunk and gathering-system installations we have found that the normal variation in grades of crude handled keeps the prover tanks clean. Our meter-factor records indicate very satisfactory proving results.

Large capacity meters . . . As the demand for larger capacity meters developed and the meter manufacturers responded, some action was required to provide larger-capacity proving facilities. For this we have designed a 300-bbl. double weir type of prover tank. The prover is based on the principle of a fixed volume between two knife-edge surfaces.

It consists of a cylindrical tank equipped with an overflow connected to a cylinder with reduced cross-section mounted alongside the fixed-volume section. The smaller section is graduated and connected to the fixed-volume section in a manner such that the total volume run through the meter can be accurately read as the sum of the volume between the knife edges and the volume that overflows into the smaller section. A schematic sketch of this prover is shown in Fig. 4.

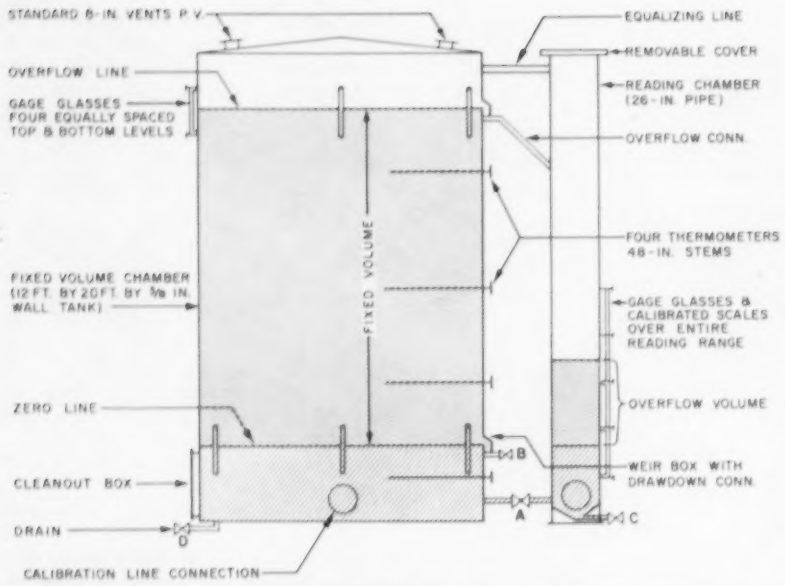
Results obtained with this facility have been very satisfactory. It has been used to calibrate meters delivering 50 bbl. per minute. It has been in operation for a 10-month period, during which time approximately 75,000,000 bbl. of oil have been delivered using the tank as a prover for the meters.

A second tank of this design recently has been installed at another location on our system. Considerable interest also has been indicated by other companies. Some of the advantages of this type of prover are:

1. It can be enlarged to accommodate meters with capacities exceeding 10,000 bbl. per hour.
2. Simple to operate.
3. Low construction cost.
4. Provides longer calibration runs which more accurately reflect true meter performance.

Maintenance and Meter Reliability

Because our maintenance-cost data may be influenced by limited experience, we are reluctant to quote general cost figures. Actually, on the smaller meters with 2,000,000 bbl. throughput our maintenance has been limited al-



PROVING METERS is the function of this 300-bbl. double-weir type of prover tank. It is simple to operate, has low cost, and provides long enough runs to reflect true meter performance. Fig. 4.

most entirely to inspection labor cost. There have been some temperature-compensation-device replacements and two rotating-element replacements. Expressed on a dollar per-million-barrel throughput basis for the entire number of meters the figure is insignificant.

For the larger meters which have metered over 25,000,000 bbl. each, the total parts cost has been approximately $150 per meter, or $6 per million barrels throughput. For the smaller meters which have passed approximately 1,000,000 bbl. the maintenance has been slightly higher.

The responsibility of meter maintenance in each district has been placed with the existing mechanical forces. In some districts meter service is regarded as a specialty, but only in the same sense as are magnetos, water pumps, or other auxiliary items of equipment.

A very limited amount of training and familiarization is required to acquaint the average mechanic with the essentials of meter maintenance. For larger meters, inspections are scheduled at regular intervals and are conducted by the mechanical gang under close supervision of the mechanical foreman. Preventive maintenance is practiced and liberal parts replacement is made during scheduled inspections to assure reliable and uninterrupted meter operation.

Meters have been successfully used to measure streams with characteristics varying from 40 to 500 S.U.s. viscosity, 20° to 110° A.P.I. gravity, vapor pressure from 3 to 62 R.v.p., paraffin and asphaltic base crudes, flow rates from 40 to 3,000 bbl. per hour, and under the other circumstances often expressed as objectionable to meter operation. From these experiences we feel justified in reporting the use of p.d. meters in oil pipeline service to be a sound and reliable practice.

Economics

The economics of meter measurements is a study in itself and any factual statements with respect to the economy of using meters would certainly require qualifying and supporting details. For example, installing and maintaining meters for measurement purposes only on a new system of 100,000-bbl. per day capacity at an installed cost of $40,000 to $50,000 is obviously more desirable from an economic viewpoint than the construction of three 55,000-bbl. tanks for the same purposes at a probable investment of $215,000.

But, if the tanks are required for holding purposes or are available already, then the meter installation would have to be justified on the basis of reduced evaporation, improved accuracy, better control, etc., which would result in a considerably different picture.

Experience indicates the significance of measurement accuracy is frequently underestimated and often meter installations will return the required investment on this basis alone. In discussing the economy of meter measurement, reference is sometimes made to reduced labor cost. This point has become a questionable advantage and labor saving is currently considered of minor significance in the justification of meters as a means of measurement.

A concrete example of the economics resulting from meter measurements is well illustrated by an installation recently made in the North Louisiana area. At a small gathering station where four streams terminated, six 55,000-bbl. cone-roof tanks were used for measurement purposes. One stream was measured for custody transfer while the other three were measured for checking purposes only. Bad pipe and the level of corrosive action on the tributaries into the station made volume checks at this location essential for leak control.

A meter installation to provide the same measurement function as the tanks was proposed and installed for approximately $20,000. An evaporation study indicated the annual saving in oil loss will be about 27,000 bbl. or roughly $80,000 per year. This indicates a payout period of 6 months after income taxes.

In addition to the reduction in evaporation losses four of the six tanks were sold in place, the sale price being approximately the same as the investment required for the meter installation.

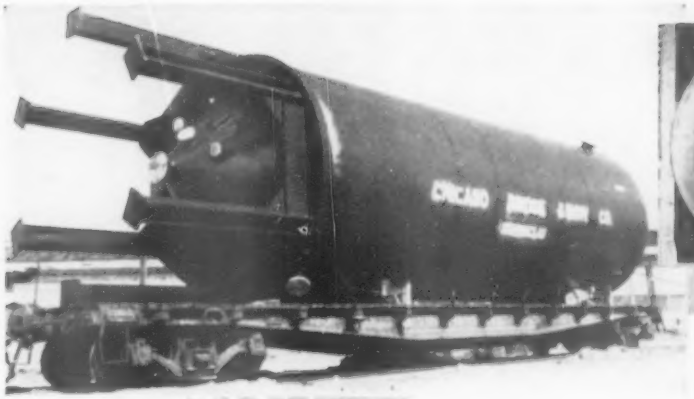
Appendix

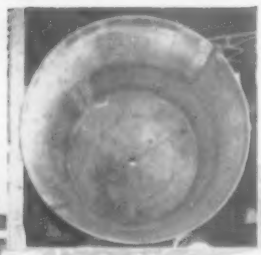
The double-weir type of prover tank is equipped with a fixed-volume chamber properly connected to a reading chamber as indicated in Fig. 4. The fixed-volume chamber is made from a standard welded lease tank, except that a ⅜-in. minimum wall thickness is used to insure against damage in handling. At a level of about 3 ft. above the tank bottom a slot is cut in the shell 18 in. long parallel to the tank bottom and 2 in. deep. The lower edge of the slot is beveled to a knife edge. The slot is enclosed by an outside box welded to the shell of the tank with a suitable outlet in the bottom equipped with a drawdown valve.

A similar weir is constructed on the shell of the tank approximately 2 ft. down from the top equipped with an overflow connection which is attached to the reading chamber. The fixed-volume chamber is equipped with 24-in. gage glass columns located on 90° spacing around the shell of the tank opposite both the top and bottom weirs.

The tank is equipped with a cleanout box, a bottom drain, pressure vacuum vents, and a calibration line connection is such that the flow of the liquid into the tank will not cause surface disturbance. The tank is equipped with four thermometers extending into the tank for a distance of at least one-third of the tank's diameter.

To the fixed-volume chamber is attached a reading chamber of reduced cross-section. The reading chamber is equipped with gage glasses on the lower





Left: 12-ft. O.D. by 43-ft. 4-in. digester with 316 E. L.C. Hortonclad. Inset: Interior of vessel built for Hudson Pulp and Paper Co. at Palatka, Florida.

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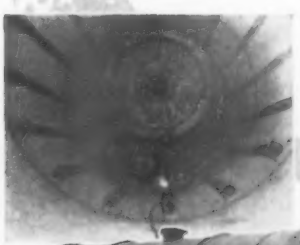
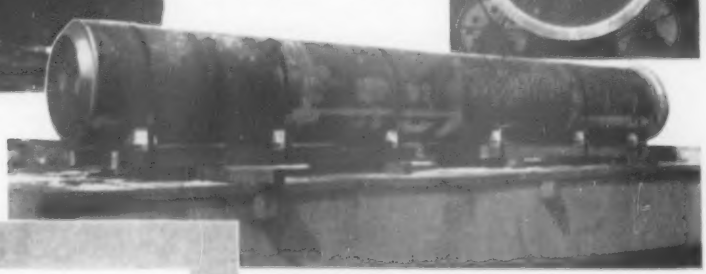


Above: A 36-ft. 9$^{15}/_{16}$-in. shell section of this 43-ft. reactor has type 405 stainless steel Hortonclad. Inset: View inside of reactor supplied to the Derby Oil and Gas Co., Wichita, Kansas, through the Fluor Corp.



Above: 37½-in. O.D. by 24-ft. 10⅝-in. urea autoclave liner with fine silver Hortonclad. Inset: View of interior.

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half of the section and connected to the fixed-volume chamber as indicated in Fig. 4. The overflow connection enters the reading chamber at a point above the top of the reading section. An equalizing line and a cleanout manway are installed. It is recommended that the bottom of the reading chamber be equipped with a conical drawdown connection.

In crude-oil and corrosive-fluid service it is recommended that the interior surfaces of both the fixed-volume and reading chambers be coated with a suitable protective-coating material.

Establishing Prover-Tank Volume

Bottom zero line . . . With valve A open, fill the tank and reading chamber with water to a level about 3 in. above the bottom weir. Close off the water supply, then open valve B and drain the water from the bottom weir box connection until flow ceases.

Make temporary zero line identification marks on the shell of the tank and reading chamber opposite the liquid level in the gage glasses. Add water and repeat the procedure until the zero line has been definitely established; a minimum of three checks should be made. Establish permanent reference marks for the bottom zero line on the tank and reading-chamber shells.

Establish overflow line . . . After the bottom zero line has been established close valve A and fill the tank until it freely overflows the top weir into the reading chamber. When the flow over the top weir ceases, make temporary overflow line identification marks on the shell of the tank opposite the liquid level in the gage glasses. Draw approximately 3 in. of water from the tank, then refill it to freely overflow the top weir a second time, making sure the level in the reading chamber is well below the overflow connection.

Repeat the operation a minimum of three times or until a definite overflow line has been established. Establish permanent reference marks on the shell of the tank at the overflow line.

Establishing volume of tank between weir levels . . . After the overflow line has been established close valve A and drain the reading chamber through valve C. Connect the withdrawal hose to the tank at some convenient valve below the bottom zero line and fill the withdrawal equipment with water, making certain all air is purged. A pump may be employed if it can be purged of all air and has no leaks. Fill the tank until it overflows the top weir; then disconnect the water supply.

Check all connections for leaks and make certain that the liquid level in the top gage glasses corresponds to the permanent reference marks for the overflow line.

Begin the withdrawal into the supplementary test measure, noting the volume and temperature of each withdrawal as outlined previously. A 500-gal. portable prover tank which has been accurately calibrated by approved methods is suggested for this purpose. Continue the withdrawal until the liquid level approaches the bottom zero line as determined by observing the lower gage glasses. The condition of the withdrawal equipment shall be the same at the end of the last withdrawal as it was at the beginning of the first withdrawal.

Close the valve on the tank through which the withdrawal has been made. Drain remainder through valve B into an appropriate smaller supplementary or primary measure until flow ceases. Examine the liquid level indicated in the lower gage glasses and if the liquid level coincides with the permanent reference marks opposite each glass as previously established, then the total volume withdrawn (corrected for temperature effect as outlined in Code 1101) shall be recorded as the fixed volume of the prover at 60° F. and atmospheric pressure.

Calibrating reading chamber . . . Close valve A and fill the reading chamber with water to a level near the top of the reading range. Disconnect the water supply, connect the withdrawal hose to valve C and fill it with water, making certain it is free from air, and observe all connections for leaks. Make a temporary reference mark on the shell of the reading chamber opposite the liquid level. Wait for a period of 5 minutes to make certain the liquid level remains the same and that the system is free from leaks. Record the opening temperature and start drawing into the 5-gal. test measure. Mark each 5-gal. decrement on the shell of the chamber.

Continue the withdrawal until the level has been reduced to a point near the zero line reference mark which was previously established, as outlined previously. Measure the over-all length of the reading chamber between the top reference point and the liquid level after the last withdrawal. From the temperature corrected volume measured and the length of the chamber displaced compute the length of the chamber equivalent to .01 bbl.

Preparing and mounting scales . . . The reading scales shall be prepared by scribing lines at .01 bbl. increments on a suitable metal strip, preferably brass or stainless steel. The distance between lines will be governed by the diameter of the reading chamber and shall be determined by the water calibration method described previously.

After the scales have been scribed they shall be numbered and mounted in a manner such that the point on the scale representing the rated volume of the prover, i.e., the volume between the upper and lower weirs plus the volume of the lower weir, shall be matched even with the permanent zero reference point on the reading chamber. In effect this locates the line representing the rated volume of the prover tank at the same elevation as the knife edge on the lower weir. The scales should continue upward to a point sufficient to provide a reading range of about 4 bbl. The scales so marked and mounted will be direct reading and will reflect the sum of the fixed plus the overflow volumes or the measured volume by prover tank.

Proving Meters Into Double-Weir Tank

The proving of meters delivering to a double-weir type of prover tank is done as follows:

The liquid being metered is turned into the tank through the calibration line and both the fixed-volume chamber and the reading chamber are filled with valve A open (see Fig. 4). The tank is then emptied to a level slightly above the bottom weir level with a calibration pump. (A liquid-level control is recommended to shut down the pump at the proper time.) Valve B is then opened and the remainder of the liquid above the bottom weir drained to the sump.

Allow a waiting period of sufficient duration to permit the liquid level to establish itself at the bottom zero line. Check the levels in the gage glasses on the fixed volume and reading chambers to make certain that the liquid level coincides with the zero line established when the prover was calibrated. Close valve A and deliver through the meter to the prover tank a volume sufficient to barely overflow the top weir.

Allow the fluid to overflow into the reading chamber until the flow ceases, using approximately the same waiting period as was permitted for the bottom weir rundown.

Read the volume delivered opposite the calibrated scale or the reading chamber. Note the temperature readings on the four thermometers and average them for the temperature of the oil delivered. This procedure is then repeated until sufficient runs have been made to obtain a satisfactory meter factor.

From time to time, depending on service, the interior surfaces of the prover are inspected for incrustation or wax deposit by entering the tank through the cleanout box. Also, frequent inspections are recommended to make positive the top and bottom weir overflow levels remain constant.

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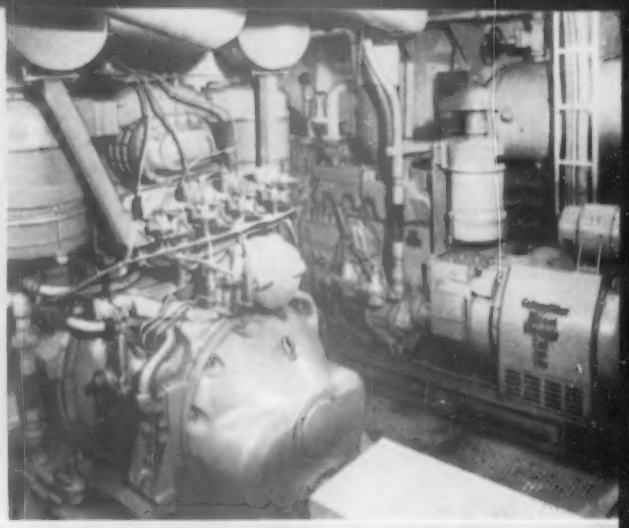

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Halliburton Oil Well Cementing Co. selected two Cat D375 Marine Diesels for propulsion and two D318 Electric Sets for auxiliary power when it built its new twin-screw cementing ship, "Halliburton 209."

Powered by the D375s, the boat has a top speed of 10 knots. It is 124′ long, 31′ 6″ wide and draws 7′ 8″. It is capable of working far out in the Gulf or in marshy areas to provide cementing services wherever offshore drilling requires them. The "209" carries 5000 gallons of fuel, 10,000 gallons of fresh water, and 4500 sacks of bulk cement.

The D318 Electric Sets generate power to operate auxiliary pumps, air conditioning and radio facilities. Each also has a front power take off that drives an air compressor for the pneumatic conveying of cement.

For Halliburton, dependability is an absolute necessity. Costly offshore drilling operations cannot afford delays. Caterpillar Engines are designed for trouble-free, low-cost operation—they're always ready to go.

And now the Caterpillar line of Marine and Oilfield Engines is better than ever. New models have been added and existing engines have been improved to give you new highs in efficiency and economy at the same level of dependability. Whatever your power requirements, offshore or inland, there is a Cat unit built for the job.

Ask your Caterpillar Dealer to show you the complete line of engines up to 520 HP and 315 KW . . . and remember, he backs the superior quality of every Cat Engine with superior service and parts.

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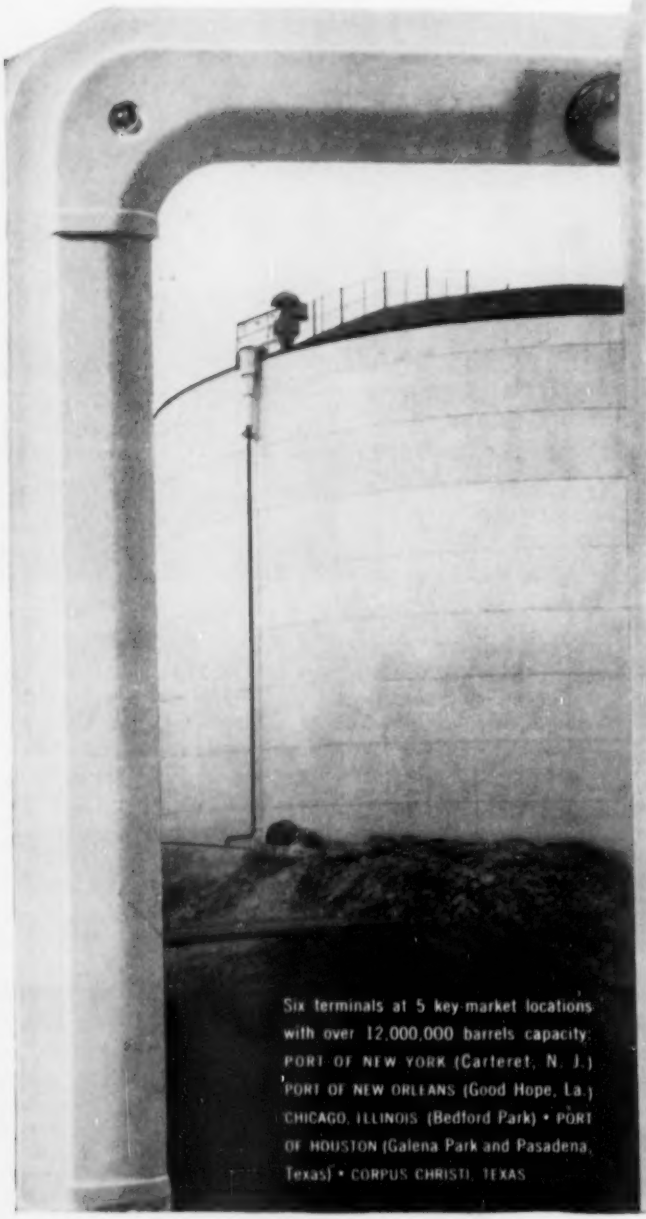

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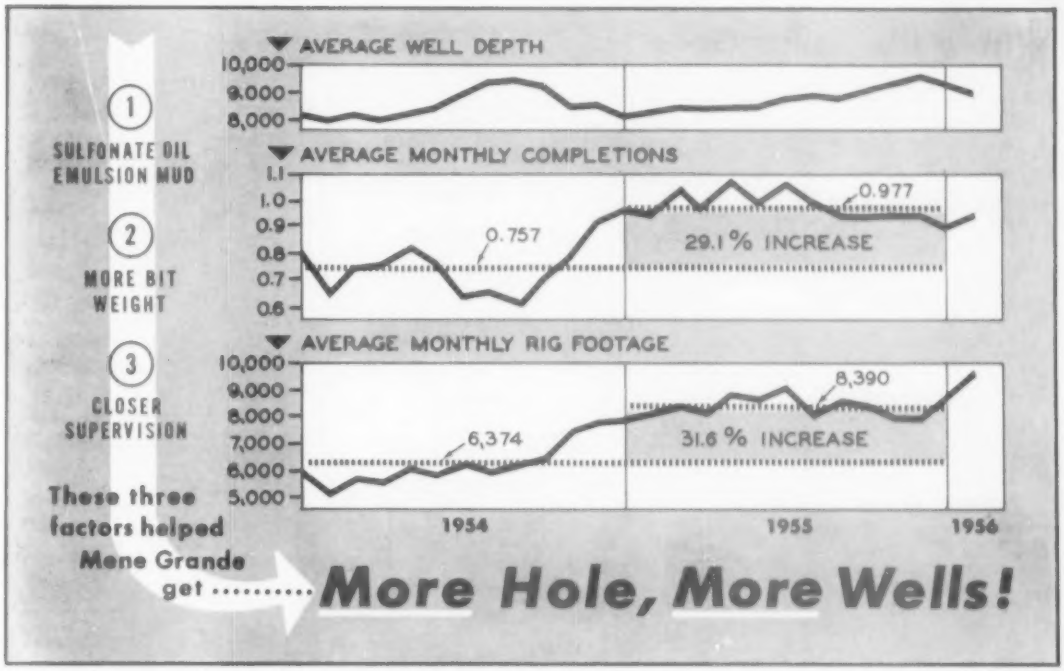


FAST DRILLING and fast moves characterize eastern Venezuelan drilling but good engineering has made improvements. Fig. 1.

In eastern Venezuela, Mene Grande reports its

Rigs Drill 31½ Per Cent More Footage

How? (1) Improved drilling mud, (2) increased weight on bit, (3) more and better supervision

by W. M. Sanders, F. G. Van Matre, E. D. Arnold, and H. J. Huebner

DURING the past 26 months, from January 1, 1954, through February 1956, there has been a substantial increase in drilling rates on development wells in Mene Grande Oil Co.'s eastern Venezuelan district.

The extremes during this period were a low of 4,964 ft. per rig per month in April 1954 and a high of 10,242 ft. per rig per month in May 1955. Rates during each of the past 3 months has been within 1,000 ft. of this record. The increased rates are attributed to improved drilling mud, increased weight on bit, and increased supervision.

The number of wells completed per rig per month has ranged from 0.491 in February 1954 to 1.238 in March 1955. Of course this figure is effected by the average depth of the wells, but even though the average well depth increased, the footage rate increased more rapidly allowing the greater number of completions per rig per month to be made. A comparison of the average figures for 1954 with the averages for 1955 showing the percentage increase illustrates the above relationship very well in the accompanying table.

Authors are, respectively, assistant drilling superintendent, district drilling engineer, drilling engineer, and drilling engineer, Mene Grande Oil Co., Venezuela.

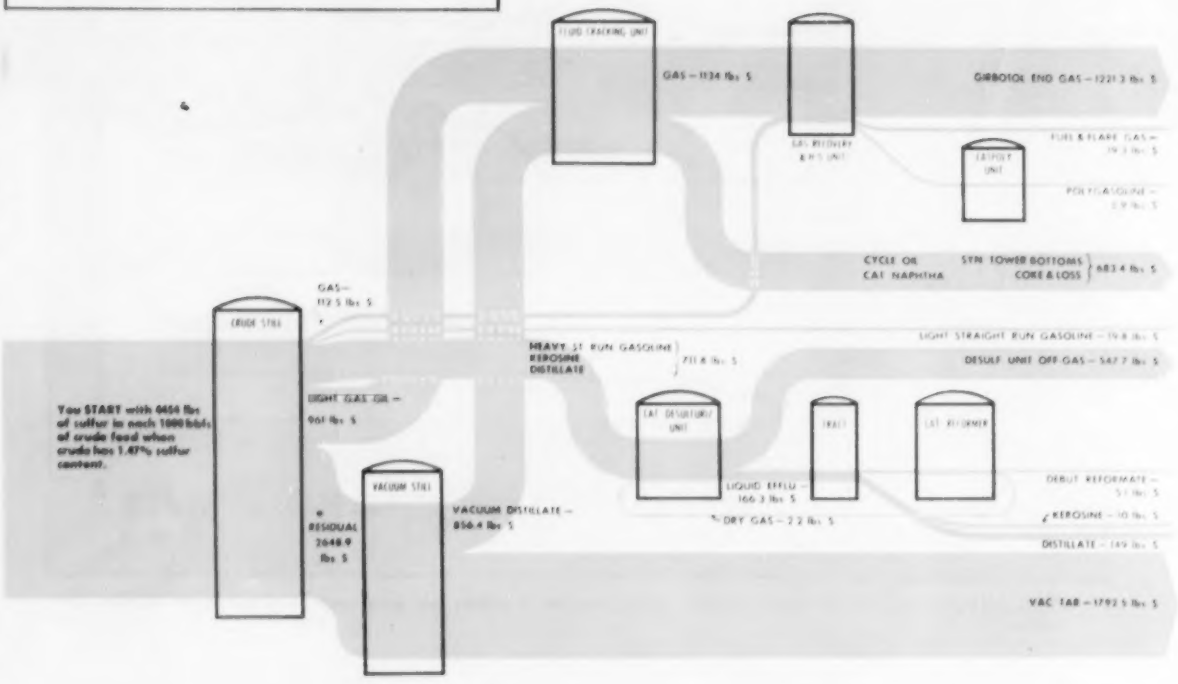
	1954	1955	Per cent increase
Average feet per rig-month	6,374	8,390	31.63
Average completions per rig-month	0.7565	0.977	29.15
Average final depth of wells	8,641	8,831	2.20

To illustrate the trends during the past 26 months, the monthly averages (Table 1) are shown in Fig. 1. Since both footage and completion figures fluctuate considerably when several wells are being completed at the same time, a 3-month rolling average was plotted to more clearly show the general trend. The 3-month rolling average was obtained by averaging the values for 3 consecutive months and plotting the value obtained on the last of the 3 months.

Drilling conditions . . . Many of the conditions existing in eastern Venezuela are conducive to fast drilling and fast rig moves and should be mentioned for comparison with other areas.

The formations range from Miocene

Where the Sulfur Goes



How to save up to 7¢ per barrel on lead

Ethyl Research studies show you can increase the octane number by decreasing the sulfur . . . and use less lead!

Getting the most from your lead is a complex business involving among other things, hydrocarbon blending and control of sulfur concentration in the fuel to be leaded. The Ethyl Corporation is constantly studying the interrelation of all the variables which affect lead utilization.

The antagonism of sulfur and tetraethyllead has long been known, but the refiner's problems today are 1) how much sulfur can justifiably be removed on the basis of savings in tetraethyllead and 2) what process can best be used to remove this sulfur. The advent of large volumes of high-pressure hydrogen at relatively low cost as a by-product of catalytic reforming processes has altered the entire economic picture of sulfur removal.

Actually the over-all justification of sulfur removal at one point or another in the refinery is composed of a number of complex factors including:

1. **Decreased product odor**
2. **Decreased refinery corrosion**
3. **Lessened refinery operating problems**
4. **Improved color and lessened gum formation**
5. **Improved tetraethyllead response**
6. **Sale of recovered sulfur**
7. **Avoidance of catalyst poisoning**
8. **Improvement in lube-oil life in the engine**

Of these various factors, perhaps the easiest to assign dollars-and-cents justification to (and certainly the one with most widespread application) is a saving in tetraethyllead.

Figure 1 shows the effect of the type of sulfur compound on Research octane number loss. This plot is based on U.S. pool gasoline which has a 79.2 Research octane number clear and a 92.0 Research octane number with 3 cc. of lead, and which contains 0.075 per cent total sulfur which may take the

form of the various compounds shown below.

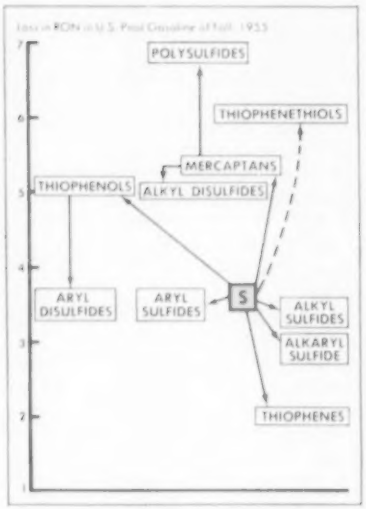


Fig. 1. *Effect of type of sulfur compound on RON loss*

Actually, a reasonable assumption would be that gasoline contains half monosulfide sulfur and half thiophenic sulfur. Complete removal of this sulfur, although economically attractive, is a practical impossibility. With the advent of hydrogen treating, however, there is no reason why 50% sulfur removal cannot become a reality. Figure 2 illustrates the TEL savings which are possible with 100%, 75% and 50% sulfur removal from U.S. pool gasoline of 91 RON with 2.38 ml. of TEL.

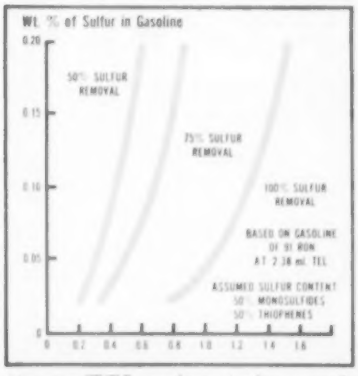

Wt. % of Sulfur in Gasoline
50% SULFUR REMOVAL
75% SULFUR REMOVAL
100% SULFUR REMOVAL
BASED ON GASOLINE OF 91 RON AT 2.38 ml TEL
ASSUMED SULFUR CONTENT
50% MONOSULFIDES
50% THIOPHENES

Fig. 2. *TEL savings (ml. per gal.) with sulfur removal*

The average refiner, while he may be interested in the above data, still wants to know, "What's in it for me?" and Figure 3 answers this question. Here the possible savings in cents per barrel of gasoline are shown as a function of the weight per cent sulfur in the gasoline pool. This relationship is independent of the lead susceptibility of the particular stock and of the Research octane number level. Here, again, we are assuming half monosulfide sulfur and half thiophenic sulfur, and the economics of 50 and 75 per cent sulfur removal are shown for TEL levels of 1.5 and 3.0 ml/gallon.

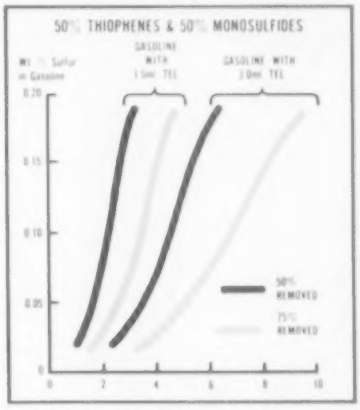


Fig. 3. *¢ per bbl. savings possible*

For example, it can readily be seen that a pool gasoline requiring 3 ml/gal of TEL and containing 0.10% sulfur could meet the same octane specifications with a saving in TEL cost of 7 cents per barrel if 75% of the sulfur were removed.

It is not unreasonable to assume that pool octane number could be raised one unit by desulfurization. Current octane-improvement costs, as shown by recent Ethyl studies, range as high as 16 cents per Research octane number per barrel. Therefore, 16 cents per barrel could be considered a justifiable expenditure for desulfurization on the basis of Research octane quality alone. Your justification will depend on the conditions specific to your refinery.

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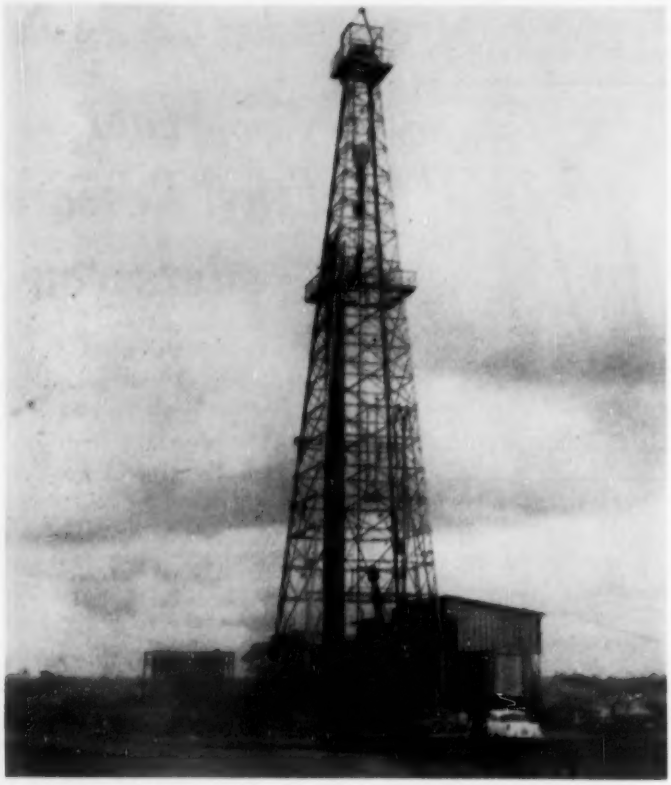


DEEP DRILLING RECORD by Rig 1, here, was 10,000 ft. in 6 days. Other records are 11,000 ft. in 12 days and 12,000 ft. in 23 days. Record footage in one tour is 2,230 ft. Fig. 2.

to Eocene in the deeper wells. The surface hole is made through the Mesa formation which consists of loose gravels, boulders, and coarse conglomerates. Next comes the Las Piedras formation which is mostly clays, shales, and some medium-hard sandstones scattered fairly evenly throughout the 3,500-ft. section. The Freites formation consisting mostly of shale follows for about 2,500 ft.

This shale is a brittle, bentonitic shale which can give trouble if the water loss is allowed to run too high. Little difficulty is encountered in this shale, however, with the oil-emulsion muds used having a water loss of 4 cc. or less. The Oficina formation, which contains the pay zones, comprises the balance of the depth in most of the wells and is 5,000 to 6,000 ft. thick. It is predominantly sandstones interbedded with shales and becomes progressively harder with depth.

The drilling is roughly equivalent to some areas in the Gulf Coast with one important exception. There are no abnormal pressures and mud weights are usually kept below 10 lb. per gal. (75 lb. per cu. ft.) in all areas except one in which the weight is sometimes carried as high as 12 lb. per gal. (90 lb. per cu. ft.).

The terrain is mostly rolling grassy plains which allows rigs to be skidded (moved on Athey tracks) at 2 or 3 m.p.h. across country. Only during the rainy season are there any delays caused by equipment bogging down. In some areas where there is considerable brush and eroded terrain skid roads are cleared with bulldozers to allow the skidding.

Also eliminated are such extras as walkways, mud tanks, etc., that are necessary in many areas. Therefore, with only the bare essentials of equipment, a five-boiler steam rig with standard derrick can be moved, rigged up, and the well spudded in less than 24 hours from the time of rig release from the last location.

Type of rigs . . . The rigs used in this developmental drilling program are steam rigs having in most cases five 150-hp. boilers. The derricks are standard 136-ft. derricks built with skid beams installed ready for the Athey tracks to be attached for moving. Some of the rigs have draw works with 14 by 14-in. steam engines and the main mud pumps are two 19 by 7¾ by 22-in. pumps. Others have draw works powered by 12 by 12-in. steam engines and have two 16¼ by 7¾ by 20-in. main mud pumps. Most of the larger rigs have separate rotary-drive engines so that a wide range of rotary speeds are available.

On January 17, 1956, Rig No. 28, recently referred to as "probably the biggest power rig ever mounted on a trailer" *(see Petroleo Interamericano, February 1956)*, spudded in on its first well.

This rig consists of a draw works, rated to 10,000 ft. with 4½-in. pipe, three 400-hp. engines with torque con-

ONLY SEVEN BITS were required when Rig 1 set the 10,000-ft. drilling record. Mud in use was a crude-oil emulsion stabilized by a petroleum sulfonate material. Fig. 3.

TABLE 1—MENE GRANDE OIL CO. DRILLING—COMPLETION ANALYSIS—EASTERN VENEZUELA

1954—	Footage drilled	Rigs operating	Avg. ft. per rig	3-month rolling avg. ft. per rig	Completions	Avg. comp. per rig	3-month rolling avg. comp. per rig	Average depth of wells	3-month average
January	123,615	24.0	5,151	6,051	19	0.792	0.807	8,565	8,087
February	133,022	26.0	5,116	5,121	12	0.461	0.665	7,904	8,012
March	169,276	25.0	6,771	5,679	25	1.000	0.746	7,960	8,143
April	125,596	25.3	4,964	5,608	21	0.830	0.760	8,178	8,014
May	162,810	24.1	6,756	6,151	15	0.622	0.820	8,694	8,277
June	138,252	22.8	6,064	5,909	18	0.789	0.748	8,556	8,476
July	124,548	20.4	6,105	6,324	11	0.539	0.654	9,563	8,938
August	110,111	20.2	5,451	5,882	13	0.643	0.662	10,118	9,412
September	140,089	20.8	6,735	6,103	14	0.673	0.619	8,734	9,472
October	154,091	21.2	7,268	6,500	18	0.849	0.723	8,903	9,252
November	164,840	20.1	8,201	7,392	18	0.895	0.805	8,022	8,553
December	160,422	20.3	7,902	7,782	20	0.985	0.909	8,499	8,475
1955—									
January	165,485	21.4	7,733	7,941	22	1.028	0.971	8,266	8,262
February	179,366	21.0	8,541	8,058	18	0.857	0.957	8,277	8,347
March	183,132	21.0	8,720	8,328	26	1.238	1.041	8,771	8,439
April	141,174	19.7	7,166	8,163	16	0.812	0.972	8,194	8,414
May	201,775	19.7	10,242	8,710	23	1.155	1.073	8,548	8,504
June	170,767	20.1	8,496	8,634	20	0.995	0.988	8,866	8,536
July	165,797	20.2	8,208	8,972	20	0.990	1.046	9,007	8,807
August	143,057	18.7	7,650	8,117	18	0.962	0.982	8,907	8,927
September	175,867	17.7	9,935	8,597	15	0.847	0.933	8,659	8,858
October	131,969	15.3	7,318	8,301	15	0.980	0.930	9,728	9,098
November	95,904	14.3	6,706	7,986	11	0.769	0.865	9,832	9,406
December	163,414	16.4	9,964	7,996	18	1.097	0.949	8,914	9,491
1956—									
January	186,867	20.2	9,250	8,640	17	0.840	0.902	9,057	9,267
February	215,670	22.8	9,459	9,557	21	0.920	0.9523	9,022	8,997

Three-month rolling average for any given month is calculated by adding the total footage drilled or total completions for that month to the totals for the 2 previous months and dividing by the total number of rigs operating in the 3-month period.

verters, and a 20½-in. rotary, all mounted on the trailer.

The derrick is a 143-ft. full-view mast with the substructure built for skidding on Athey tracks. The main mud pump is driven by a 400-hp. engine and also connected through a secondary compound by a torque tube to the main compound on the trailer. The second mud pump is a 7¼ by 14-in. pump with a separate 400-hp. engine with torque converter.

Until February 29, 1956, the end of the period covered by this report, this rig had drilled three wells totaling 23,213 ft. and had spent 24½ days of this time running casing, completing, and moving.

On a monthly basis this footage gives an average of 15,475 ft. per month for this rig which is 65 per cent above the over-all average. Therefore this rig has contributed substantially to the high-average footage rate of the past 2 months.

There is also one 7½-year-old trailer rig which is building up an enviable record drilling 4,000-6,500-ft. stratigraphic test holes. The footage drilled by this rig is not included in this data as it is not part of the development drilling program. The rig seldom sets casing and never makes completions, consequently it has been able to drill as much as 27,040 ft. of hole in 1 month, accomplished in January 1956. E. J. Aubyn is the tool pusher supervising this rig.

Three main factors . . . It is felt that the increases in footage rates and completion rates are due primarily to three major factors:

1. An oil-in-water emulsion mud containing a small amount of the sodium salt of preferentially oil-soluble sulfonic acids was developed by R. J. Tailleur, eastern district chief drilling-mud engineer for Mene Grande. This emulsion began to come into general use during the first half of 1954. This mud is patented.

2. The use of longer drill-collar strings with accompanying increase in bit weights was begun.

3. An increased number of tool pushers and consequent closer supervision, plus the development of a highly cooperative attitude and a competitive team spirit on the part of the Venezuelan drilling crews.

Tailleur's work with oil-emulsion mud was based on the theory that a lower-surface-tension mud allowed a wetting action to take place ahead of the bit causing faster drilling rates. The use of petroleum sulfonate was an economical way to achieve the desired surface-tension reduction and produce a stable emulsion at the same time.

Field tests were made on several wells using "petronate" oil-emulsion mud and comparisons were made with nearby wells drilled by the same rigs using normal oil-emulsion muds. Other factors affecting drilling rate such as type bits, weight on bits, etc., were maintained as nearly identical to those on the comparison wells as possible. Table 2 shows the results obtained from these comparisons which indicated over-all time savings from 8 to 50 per cent by the use of petronate mud over the intervals considered.

Bit weight . . . Until August 1954 it was common practice in the eastern Venezuela district to run from eighteen to twenty-one 6-in. drill collars for drilling an 8½-in. hole to 8,000 ft. or deeper. In August and September 1954 experiments were conducted under the direction of D. H. Caddel, drilling superintendent, eastern district, to determine the effects on drilling rate of increasing the number of drill collars used for drilling into the 10,000-12,000-ft. range.

On two rigs the number of drill collars was increased to 24, then 27, and then to 30. Progressively increasing penetration rates were noted. Therefore, it was decided to standardize on the use of thirty 6-in. drill collars for the deeper wells. Two or three 7-in. drill collars are used in addition to the 6-in. collars for drilling the 13¾-in. surface hole and on down as far as 5,000 or 6,000 ft. in the 8½-in. hole. In some wells two 8-in. collars have also been used on the surface hole.

Previous practice, with eighteen to twenty-one 6-in. drill collars was to gradually increase bit weights from 5,000 to 15,000 lb. by the time 6,000 ft. was reached with the rotary table running at or near its maximum speed. Below 6,000 ft. the bit weights gradually increased up to a maximum of 35,000 lb. at 12,000 ft. and a relatively fast rotary speed was maintained. Present practice, although unchanged

above 6,000 ft., is to increase bit weight more rapidly below 6,000 ft. to reach a maximum of 50,000 or even 60,000 lb. at 12,000 ft.

Rotary speeds are slowed to 80 or 100 r.p.m. with these higher weights, and it has been found that cones are lost in the hole far less often than when the higher speeds were used. Hole-deviation problems have been mostly above 6,000 ft. in the past, but with the use of 7 or 8-in. drill collars in the shallow holes, abrupt changes in deviation have been practically eliminated.

Abrupt changes are uncommon at greater depths with the 6-in. collars, consequently crooked-hole trouble has been greatly reduced.

Relatively light bit weights were being used in the Santa Rosa area because of the definite crooked-hole tendencies found there. It was decided to use more and larger drill collars, 8-in. in 9⅝-in. hole, with greater bit weights and let the deviation go as long as no abrupt changes were encountered.

Table 3 shows the large increases in penetration rates (50 to 60 per cent) obtained and the substantial savings in time which resulted on three of these wells. Although deviation was more than doubled, the increase was gradual and caused no difficulty.

More pushers . . . A considerable increase in the number of tool pushers has made closer supervision possible, and the over-all efficiency of the drilling crews has thus been notably increased. Along with the closer supervision and the increases in penetration rates due to improved mud and drill-collar practices, a keen competitive spirit developed between the drilling

TABLE 2—SUMMARY OF PETRONATE OIL-EMULSION TEST WELLS

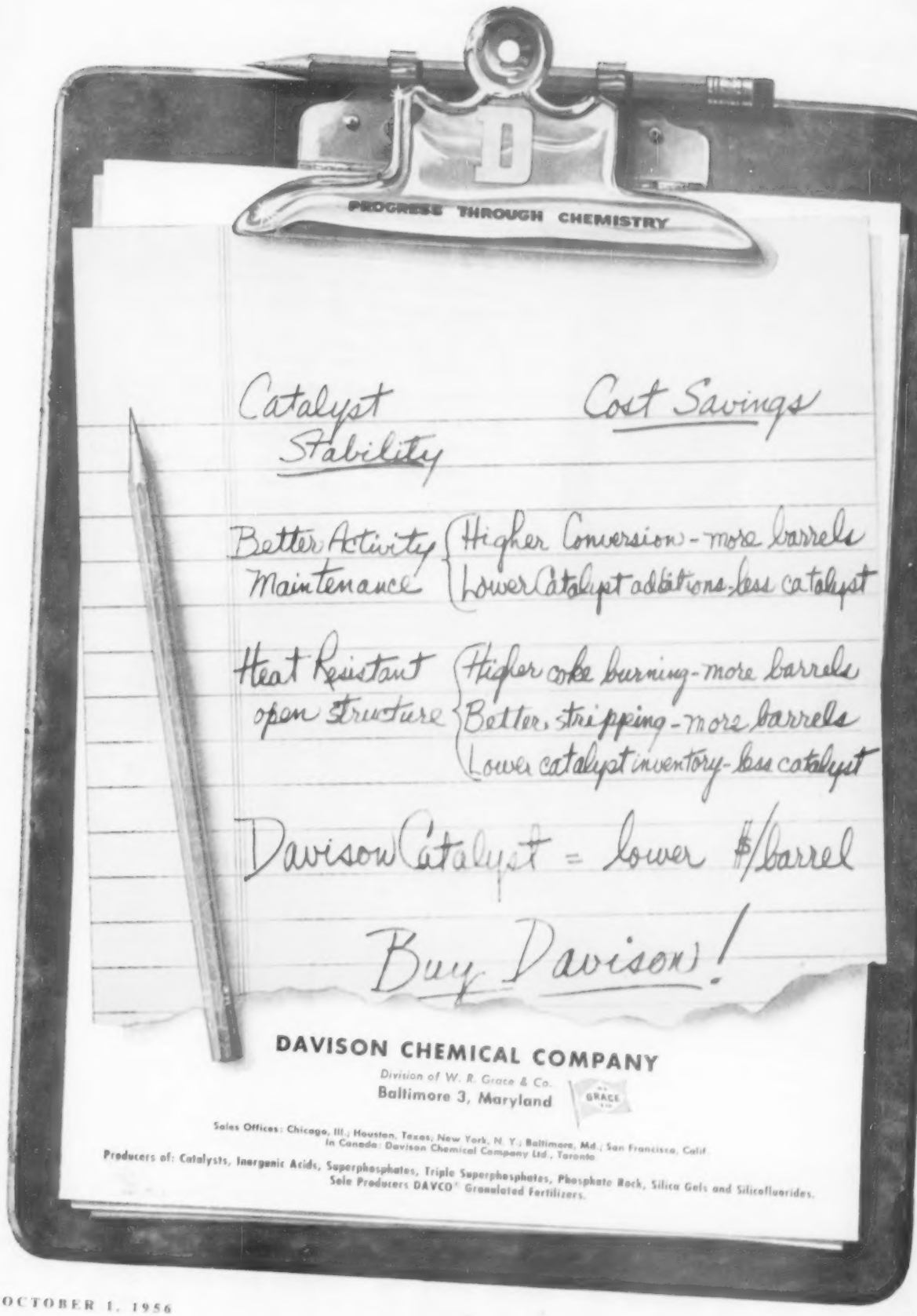
Well	Interval considered (ft.)	Days drilling	Days saved	Bits required	Bits saved	Per cent: Increased footage per bit	Per cent: Increased rate of penetration	Per cent: Over-all time saved	Oil-emulsion mud type¶
SZ-7	2,070 to 10,220	20.5	6.0	31.0	9.0	22.5	*33.9	22.6	P
SZ-4		26.5		40.0					R
CAM-313	570 to 5,550	4.5	1.5	6.0	0	0	†25.0	25.0	P
CAM-312		6.0		6.0					R
CAM-313	5,550 to 7,205	2.5	2.5	3.0	4.0	57.1	‡Unknown	50.0	P
CAM-312		5.0		7.0					R
EGS-132	489 to 6,590	7.5	1.5	9.5	2.5	20.8	‡Unknown	16.6	P
EGS-130		9.0		12.0					R
LG-504	590 to 7,175	8.0	2.5	12.0	0	0	†23.8	23.8	P
LG-503		10.5		12.0					R
SG-37	6,200 to 10,225	19.0	6.0	30.5	10.0	24.6	‡Unknown	24.0	P
SG-33		25.0		40.5					R
SM-216	6,685 to 11,000	27.0	2.5	40.5	5.5	11.8	*21.9	8.4	P
SM-214		29.5		46.0					R
SG-302	3,400 to 9,000	13.0	4.5	15.0	6.0	28.5	§15.0	25.7	P
SCJ-6		17.5		21.0					R
SCJ-206	2,150 to 9,882	15.5	7.0	22.0	12.5	36.2	‡Unknown	31.1	P
SM-215		22.5		34.5					R

*Values calculated from drill-logger recordings. †Not recorded and cannot be correctly estimated because of difference in round trip. ‡Values are estimated, assuming lost time and tripping time equal in both wells. §SG-302 had 26.6 per cent of total time lost because of rig repairs and miscellaneous items and was drilling only 32.8 per cent of total time. ¶P is petronate treated; R is regular oil emulsion.

TABLE 3—COMPARISON OF LIGHTWEIGHT AND HEAVYWEIGHT DRILLING IN SANTA ROSA FIELD

	Light weights		Heavy weights		
	RG-44	RG-45	RG-46	RG-47	RG-48
A. Depth (ft.)*	3,017	2,913	3,048	2,280	2,417
1. Drill collars (number and size)	7-7-in.	10-7¾-in.	2-8-in. and 10-7-in.	9-8-in.	2-8-in. and 10-7-in.
2. Maximum deviation (deg.)	1	1	1¼	½	¾
3. Weight on bit (lb.)	1-2,000	5,000	5-10,000	3-5,000	5,000
4. Time from surface (days)	15	9	3	7	7
5. Average footage for day	201.1	323.6	381.0	325.7	345.2
B. Depth (ft.)	5,000	5,094	5,017	5,208	5,119
1. Drill collars (number and size)	10-7-in.	10-7¾-in.	2-8-in. and 10-7-in.	9-8-in.	2-8-in. and 10-7-in.
2. Maximum deviation (deg.)	1¼	1¾	3¼	2½	3
3. Weight on bit (lb.)	9-10,000	6-10,000	12,000	15,000	18,000
4. Time from surface (days)	27	16	13	12	12
5. Average footage for day	185.1	318.3	385.9	434.0	426.5
C. Depth (ft.)	7,118	7,120	7,166	7,172	7,165
1. Drill collars (number and size)	11-7-in.	10-7¾-in.	2-8-in. and 10-7-in.	9-8-in. and 6-7-in.	2-8-in. and 10-7-in.
2. Maximum deviation (deg.)	2½		4¾	5¾	6¼
3. Weight on bit (lb.)	15,000	15-20,000	25,000	15-22,000	25,000
4. Time from surface (days)	41	31	23	17	20
5. Average footage for day	173.6	229.6	311.5	421.8	358.2
D. Depth (ft.)	8,549	8,564	†7,947	8,570	†8,550
1. Drill collars (number and size)	11-7-in.	10-7¾-in.	2-8-in. and 10-7-in.	9-8-in. and 6-7-in.	14-7-in.
2. Maximum deviation (deg.)	2½	3	5¼	5¾	8½
3. Weight on bit (lb.)	20,000	15-20,000	25,000	18-25,000	30-35,000
4. Time from surface (days)	51	44	27	22	28
5. Average footage for day	167.6	194.6	294.3	389.5	305.3

*All wells drilled with 9⅝-in. bits below surface casing. †Final depths.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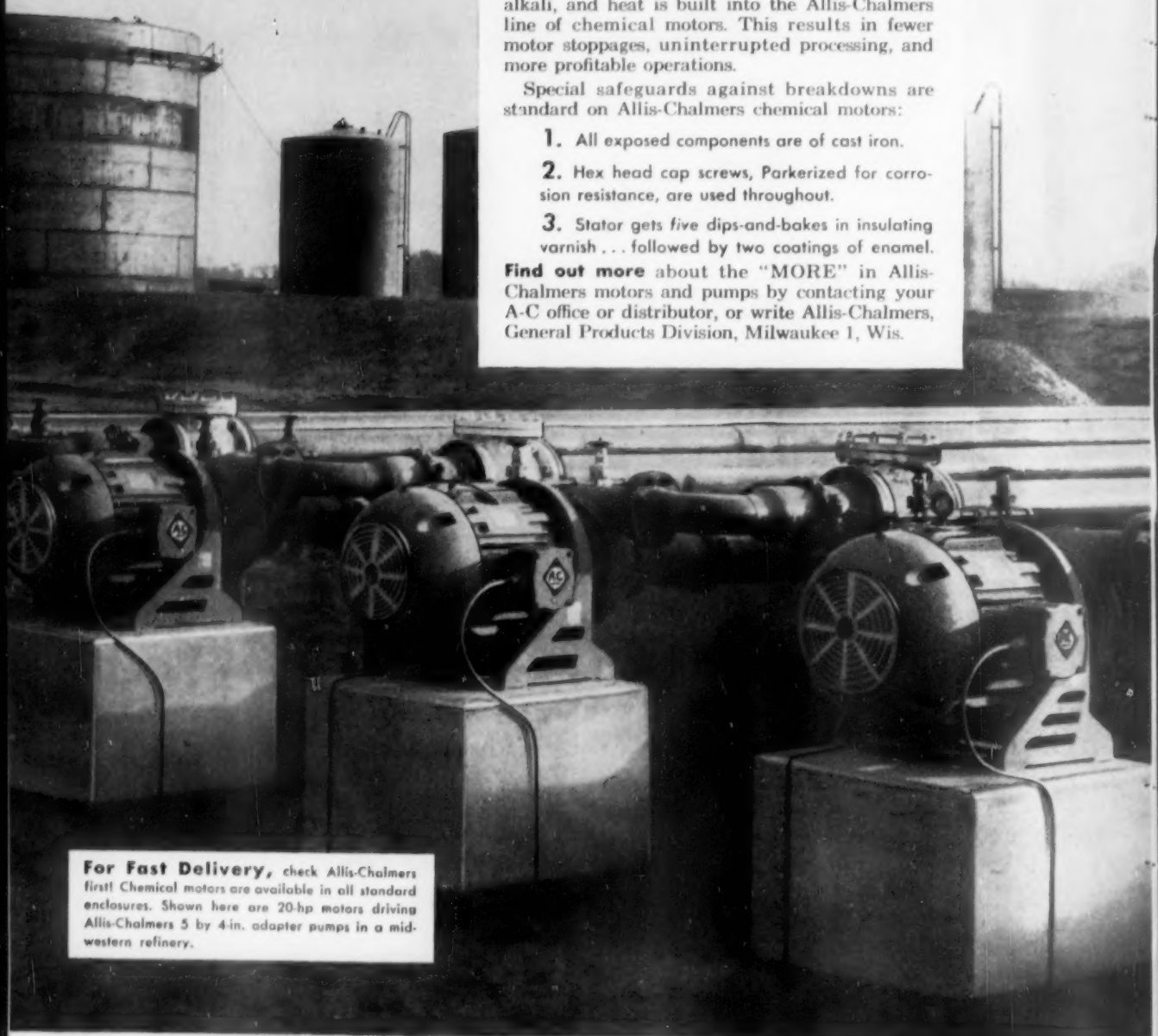

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H. W. LETTERS, left, supervised Rig 1 when it set the drilling record. W. R. Hedrick, right, was mud technician.

TOUR PUSHER Bill Byram, left, with his crew—(kneeling) Orilio Hospedales, Felix Rojas; (standing) Jose Palacios, Victor Guevara, Tomas Guerra, and Miguel Ortiga.

crews as one rig after another set new speed records. This competition has helped to save time at tour changes and on making the round trips, all of which are positive factors in getting each well drilled faster.

The practice of using workover rigs to complete new wells is just being started this year and may be partly responsible for the high footage rate per rig the past 2 months since two or three rigs have already moved to new locations immediately after setting casing.

There have been some outstanding drilling records made for Mene Grande's eastern Venezuelan district in recent months. The record times of 7 days 5½ hours from spud to 10,000 ft. and 22 days 22 hours to 12,000 ft. were achieved by Rig 2 under the supervision of Head Tool Pusher H. Vandersall on wells ZG-10 and ZG-9, respectively.

Rig 10, also supervised by Vandersall, reached 11,000 ft. in approximately 12 days 8 hours on well ZG-109. Total depth of 12,018 ft. was reached on ZG-109 in 23 days 20 hours, then the electric logs were run, casing set, and rig moved to ZG-110, and spudded in only 29 days and 1 hour after spudding ZG-109.

Rig 1 (Fig. 2) established a new record drilling time of 6 days 2¼ hours to 10,000 ft. on well ZM-20 on April 12, 1956. After spudding in at 3 a.m. April 6, 1956, 13¾-in. surface hole was drilled to 1,258 ft. Several hours were lost because of a difficult shale condition encountered at 150 ft. which caused the bit to ball up and circulation to be lost. The 1,220 ft. of 9⅝-in. surface casing was set and cemented with 700 sacks of construction cement. The surface cement job was completed 24 hours after spudding in.

The only bits used from the surface casing to 10,001 ft. were seven 8½-in. OSC-1 jet Hughes rock bits (Fig. 3). Previous fast wells required 12 or 13 bits to drill this same interval. The round trips saved would probably have required from 20-24 hours, and it so happens that 19¾ hours is the amount of time cut from the previous record time to 10,000 ft.

Mud in use at 10,000 ft. was petronate crude-oil emulsion mud with the following properties:

Weight, lb. per cu. ft.	70.5
Viscosity, seconds	112
Water loss, cc.	3.2
Filter cake, in.	1/32
Flow-line temperature, °F.	118
Per cent crude oil	17

This rig is under the supervision of Head Tool Pusher H. W. Letters. The tour pushers who worked on the rig during the record period were H. N. Brossard, B. Byram, J. W. Williamson, and D. H. Simmons. The mud technician was W. R. Hedrick.

Several of the rigs have recently drilled over 1,900 ft. of hole in the first 8-hour tour after drilling out of surface casing. The record for footage drilled in one tour is 2,230 ft., held by Rig 28, under the supervision of Tour Tool Pusher Jerome Toloudis. The first 20 minutes of this tour was spent in completing a bore-hole deviation survey.

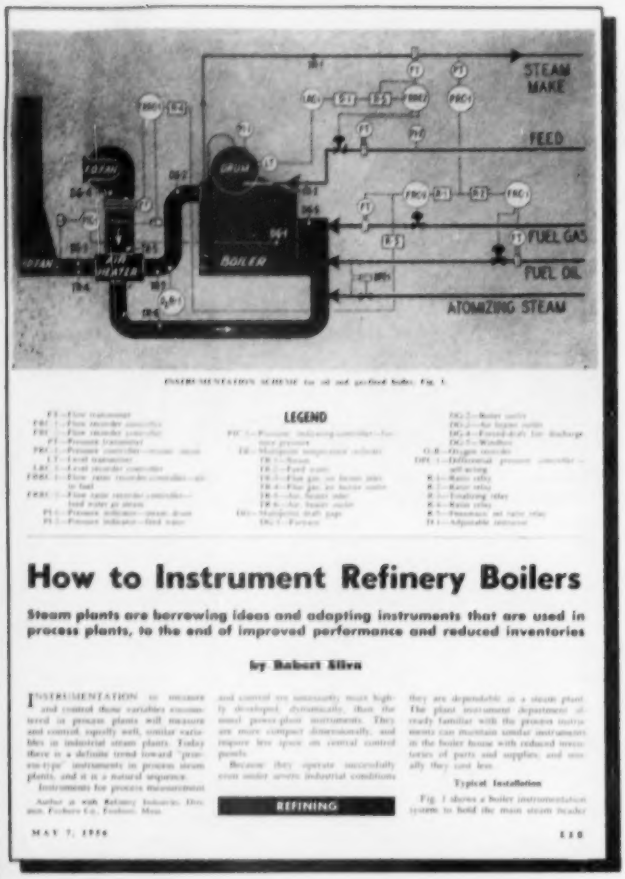
For shallow wells, GG-613 holds the record, having reached the final depth of 6,246 ft. in 2 days and 18 hours. This well was drilled by Rig 13 supervised by Letters. The first bit out from under surface casing drilled 3,870 ft. in 18½ hours, or 209.2 ft. per hour.

Future progress . . . It is not anticipated that there will be any appreciable increase in the 3-month rolling average of 9,557 ft. per rig-month unless completion times can be reduced or completions made by workover rigs, or some radical change in basic drilling technique or equipment be made.

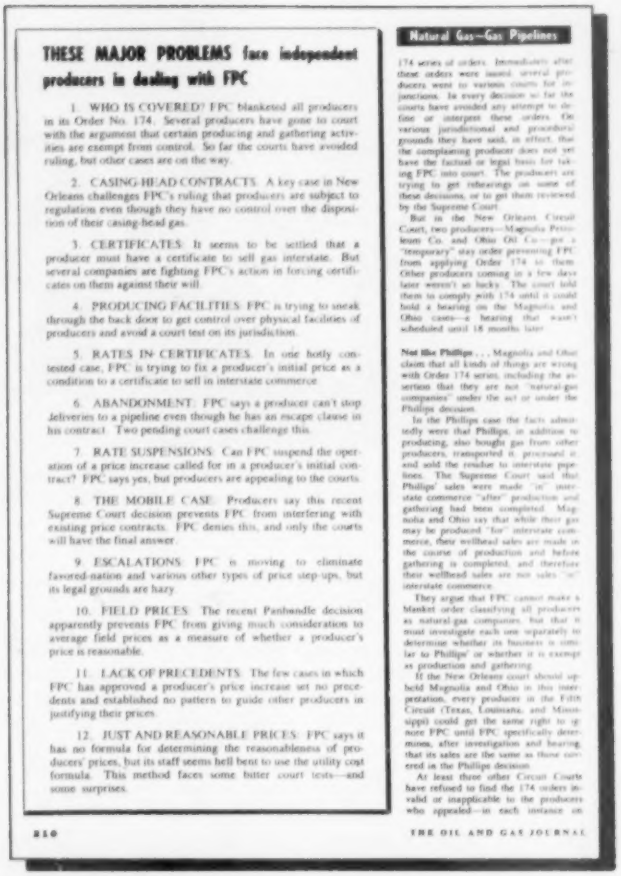
Completions by workover rigs will enable the drilling rigs to lose as little as 4 days between reaching final depth on one well and spud in on the next. This will allow a single drilling rig to make as much as 20,000 ft. or more of hole in a single month. However, if the additional workover rigs required are included with the drilling rigs when figuring the over-all average footage per rig-month, then the average will not increase unless a workover rig can complete more wells per month than a drilling rig can drill per month. At any rate, completion costs will be lower by using a cheaper rig, and more wells can be drilled without increasing the number of drilling rigs in use.

As the rigs drill more and more deep wells, the increased use of workover rigs is probably the most effective method for keeping average rates up and completion costs down. Of course, work is being continued on the technical problems of mud control and improved drilling techniques but there is a practical limit as to the additional improvements possible along these lines.

"Present practice . . . is to increase bit weight more rapidly below 6,000 ft. to reach a maximum of 50,000 or even 60,000 lb. at 12,000 ft. Rotary speeds are slowed to 80 or 100 r.p.m. with these higher weights."



1 Glance-level presentation is applied to the lead art in this article. The boiler is shown in solid black, to separate it from the various lines leading to it. The legend is placed immediately beneath the cut for maximum usefulness.


THESE MAJOR PROBLEMS face independent producers in dealing with FPC
1. WHO IS COVERED? FPC blanketed all producers in its Order No. 174. Several producers have gone to court with the argument that certain producing and gathering activities are exempt from control. So far the courts have avoided ruling, but other cases are on the way.
2. CASING-HEAD CONTRACTS. A key case in New Orleans challenges FPC's ruling that producers are subject to regulation even though they have no control over the disposition of their casing-head gas.
3. CERTIFICATES. It seems to be settled that a producer must have a certificate to sell gas interstate. But several companies are fighting FPC's action in forcing certificates on them against their will.
4. PRODUCING FACILITIES. FPC is trying to sneak through the back door to get control over physical facilities of producers and avoid a court test on its jurisdiction.
5. RATES IN CERTIFICATES. In one hotly contested case, FPC is trying to fix a producer's initial price as a condition to a certificate to sell in interstate commerce.
6. ABANDONMENT. FPC says a producer can't stop deliveries to a pipeline even though he has an escape clause in his contract. Two pending court cases challenge this.
7. RATE SUSPENSIONS. Can FPC suspend the operation of a price increase called for in a producer's initial contract? FPC says yes, but producers are appealing to the courts.
8. THE MOBILE CASE. Producers say this recent Supreme Court decision prevents FPC from interfering with existing price contracts. FPC denies this, and only the courts will have the final answer.
9. ESCALATIONS. FPC is moving to eliminate favored-nation and various other types of price step-ups, but its legal grounds are hazy.
10. FIELD PRICES. The recent Panhandle decision apparently prevents FPC from giving much consideration to average field prices as a measure of whether a producer's price is reasonable.
11. LACK OF PRECEDENTS. The few cases in which FPC has approved a producer's price increase set no precedents and established no pattern to guide other producers in justifying their prices.
12. JUST AND REASONABLE PRICES. FPC says it has no formula for determining the reasonableness of producers' prices, but its staff seems hell bent to use the utility cost formula. This method faces some bitter court tests—and some surprises.
Natural Gas—Gas Pipelines
Not like Phillips . . .
THE OIL AND GAS JOURNAL

2 Here interest is stimulated by boxing some significant problems on the latter pages of a long article. This is presentation at the penetration level. Story treatment such as this may revive interest and keep the reader on the road.

How "two-level" presentation gets a . . . and keeps him there

There are two levels of editorial presentation:

1 ***Glance level*** – *letting the reader "sample."*

2 ***Penetration level*** – *hanging on to the reader by skilful story architecture.*

Grabbing and hanging on to a reader is quite a mechanical process. It might be compared to an electric magnet. When the switch is thrown, interest is grabbed and is held as long as the current is applied. But turn the switch off, and the reader is lost — just as surely as is the load that the magnet held.

To use another analogy, the editor's job is to get the reader on the road, and to keep him traveling on the road. The road should be well marked with road signs.

THE OIL AND GAS

How T.G.T. Cuts Operating Costs . . .

. . . through better pipeline compressor techniques

● Increasing engine horsepower by supercharging, scavenger-air cooling, higher compression ratios, decreasing wasted horsepower by careful studies of station piping, better selection of compressor cylinders as to clearance volumes—these are the ways T.G.T. has cut operating costs while adding to its system capacity. This article gives results of the techniques used.

by O. H. Moore

THE volume of gas transported daily by Tennessee Gas Transmission Co. is so large that a slight improvement or efficiency of compressor equipment often returns the cost of obtaining that improved efficiency many times. Specific fields of improvement have been in more efficient compressor cylinders, better fuel economy, and higher compression and turbocharged engines.

The present-day installation costs of new compressors makes the modification of old equipment an attractive project in almost any conversion cost. This is especially true in compressor buildings that have already reached their ultimate design in the number of installed units. Increasing the horsepower per the individual units does not call for an increase in the number of employees and, in almost every case, improves fuel economy of engine.

Method of Increasing Horsepower

Compression pressure . . . Raising the compression pressure is a definite possibility for most of T.G.T.'s engines. Where this is done, we get a flat 10 per cent increase in horsepower, with a resulting improvement in fuel economy. The conversion to higher line pressure is done by changing power-cylinder heads.

Tailored scavenger air . . . Experimental work on two-cycle engines indicates that an additional 5 to 7 per cent increase in horsepower is available through cooling of the intake air in the engines. Heat exchangers were placed between the scavenger air cylinders and power cylinders to reduce the heat of compression from the intake air. The cool intake air also resulted in an improvement in fuel economy. (See Fig. 3).

Turbocharged engines . . . Sufficient operating experience is now behind the first installation of turbocharged equipment on two-cycle engines to prove that this type unit can be operated in this manner. There are two types of installation: the pulse type calling for individual exhaust lines from the cylinders to the exhaust turbine, and the constant-pressure type where a common header to all cylinders carry the exhaust gases to the turbine.

Starting of engines with either type installation is not too difficult, and most gas engines seem to be easy and to the extent of load they will carry as long as there is sufficient scavenger air. The fuel cycle takes an entirely different shape from that of one from the conventional-type two-cycle engine.

T.G.T. is now installing exhaust turbine-supercharge equipment on a 1,800-hp. two-tandem, double-acting horizontal, four-cycle gas engine. We expect to take as much as 25 per cent more horsepower out of this unit. A similar installation has been in service on another pipeline for some time, and we have reports of very promising results.

Fig. 2 shows the type of fuel curve obtained from a turbocharged two-cycle engine.

Station Piping

The volume of gas moving through T.G.T.'s network of piping requires a careful study on the part of the designating engineer. Excessive pressure drop through a station yard or inadequate design of the piping to even an

PIPELINING

Tennessee System One of Nation's Largest

Tennessee Gas Transmission Co.'s high-pressure, multiple-pipeline, gas-transmission system extends from the Mexican border to the New England seaboard. Wide variations in operating problems are encountered throughout the line. This calls for constant vigilance by T.G.T.'s compressor department to keep pace with the problems encountered in the operation of the compressor equipment required to move upwards of 2 billion cubic feet of gas per day. Even though an extensive long-range study is made of the initial plans as to capacity, pipe size, compression station spacing, gas purchase and gas sales points, many complicated problems cross the picture when a company expands almost 10 times its initial size in a span of 12 years.

Tennessee Gas has, at present, 27 main-line compressor stations with a total of 533,720 hp. installed to work on the gas stream. The daily labor cost for 1955 runs to five figures. Fuel consumption of 93 M.M.c.f.d. is about one-half of the initial capacity of the system. The equivalent of a 3,000-gal. transport truck is required to make a daily trip to keep the system supplied with lubricating oil.

Automation on the Lease

Fig. 1

Fig. 3

Fig. 4

How Production Controls Work

. . . and what's needed for more efficiency

by L. M. Nubby

AUTOMATION of lease facilities has been under way for a number of years and many installations have been made. These applications are still in the development stage, however, and new developments are coming rapidly. Some of the problems they bring the industry are:

★ Standardization of methods and equipment so that automatic installations can be made on a routine basis.

★ Development of well controls so that type of well can be automatically produced efficiently.

★ Improvement of parts of the well test system such as manifold valves

PRODUCING

3 Here sidelight material is boxed off so the reader can take it or leave it. It's there for the person who might want it, but out of the way of the reader who doesn't. The deck is a follow-through, and keeps the reader on the road.

4 Here's glance-level presentation. The sketch shows a diagram of an actual system and the photos and cutlines tell how the controls work. The lead immediately lists the problems which automation is bringing to the industry.

business magazine reader on the road—

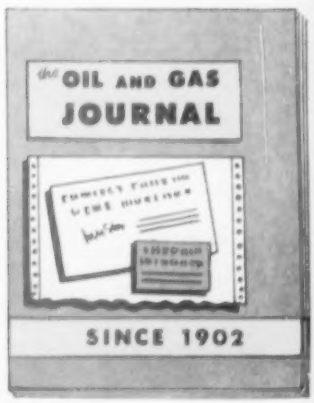
Here at The Journal we don't consider that the job of "presentation" ends with flagging the attention of the reader with headline, deck, and illustration. That's only the start. The real test of the article's architecture is whether the story can hold the reader's attention, and keep him from "flipping the page," and thus be lost for further reading.

So we make sure the text of the article gets off to a running start. Often this means that the author's summary paragraph, which he placed at the end of the article, is promoted to the lead paragraph. It means that historical material is broken out and made "optional" reading — there for those who want it, but not in the way of those who don't.

Liberal use of subheads and sideheads is another means of keeping the reader on the road. These serve as booster stations to keep interest sustained and to prevent a dull-gray look. Or perhaps a highly significant point is broken out from the text and printed in larger, bold-face type.

The Journal does not start an article out, give it a couple of pages or so, then ask the reader to "please turn to page xx" for the rest of the article. Articles are published all together, a convenience to the reader, and a boon to the "clipper."

This is the fifth in a series of "workshop" advertisements on the technology of building better business magazine readership.



ABP ABC

JOURNAL TULSA, OKLAHOMA

ELEMENTS OF FIELD PROCESSING—19

Back-Pressure and Pressure-Reduction Control—2

by Dr. John M. Campbell

At pressures above 125 psig. it is usually difficult to justify anything other than a pilot-operated diaphragm motor valve for pressure control. Non-pilot loaded valves are sometimes applicable but usually only in those circumstances where pronounced load changes are not encountered. At these higher pressures the cost differential also becomes less, which further encourages the use of pilot-operated controls.

Most pilots now in use in the oil field are pneumatic in nature and use natural gas as the actuating fluid. Any natural gas that is free of fluids and at a pressure greater than 15 psig. is suitable in this service.

Pilot Workings

Fig. 1 is a schematic view of a pressure pilot that will give both proportional and on-off control. As the controlled pressure varies the bourdon tube (A) will change shape and in turn raise or lower the curved bar (B).

The supply pressure is held constant between 15 and 20 psig. by pressure regulator (F). The vent (C) is so sized that when wide open (curved bar away from it) it will pass more gas than orifice (E). Consequently the pressure on the valve diaphragm and the valve position depend on the opening of vent (C) which in turn depends on the position of the curved bar, as fixed by the bourdon tube.

If the vent is wide open the pressure on the diaphragm is zero while if it is fully closed the diaphragm pressure equals the controlled supply pressure.

Limited vent . . . It is necessary that both the vent and orifice be very small in order to minimize the amount of gas vented. If the curved bar (B) had a fixed pivot at (G) rather than a bellows, only on off (snap) action would be possible because of these small openings. From a purely mechanical standpoint any small movement of the curved bar would in effect make the vent wide open.

The bellows (D) is used to impart a rotating motion to the curved bar around the end of the vent. When the bar begins to rise off the vent the bellows contracts which tends to keep part of the vent opening covered. As a result more vertical movement of the bar is necessary to fully open (or close) the valve. All in-between points then represent some degree of proportional control.

The vertical distance that the bourdon tube has to lift the bar to completely stroke the valve increases as the lever arm represented by the distance between (C) and (D) decreases. This then allows for adjustment of the proportional band.

If the vent is close to the left end of the curved bar the movement of the bellows imparts little rotation to the bar and on-off action results.

Control markings . . . Most pressure pilots have the bar marked to show various percentages of proportional control. The percentage shown indicates that the controlled variable must vary through that percentage of the instrument's range to fully open or close the valve.

Example—If a pressure pilot has a bourdon tube with a range of 0-200 psig. and it is set on 50 per cent proportional control how much must the pressure vary to make the valve be fully stroked?

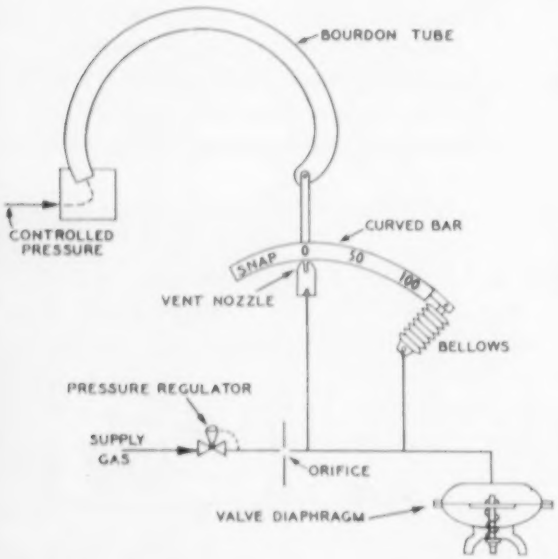
Answer—It must vary (0.50) (200 — 0) = 100 psig. to fully stroke the valve.

It therefore follows that the closer the vent is to the bellows the higher the precentage of proportional control obtained.

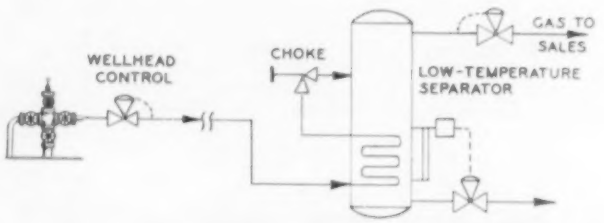
Most pressure pilots are slightly more complex than the schematic presentation in Fig. 1, in order to improve the mechanical action and the sensitivity. However, the basic mechanism and principle of operation shown are common to all pneumatic pilots.

Balanced-diaphragm pilots . . . In most applications the valve is spring-loaded but there are some where a large quantity of high-pressure gas must be controlled with a low-pressure drop. Such an application is encountered with the switching valves of a dry desiccant dehydrator. A large inner-valve assembly is required which increases the unbalanced forces on the diaphragm,

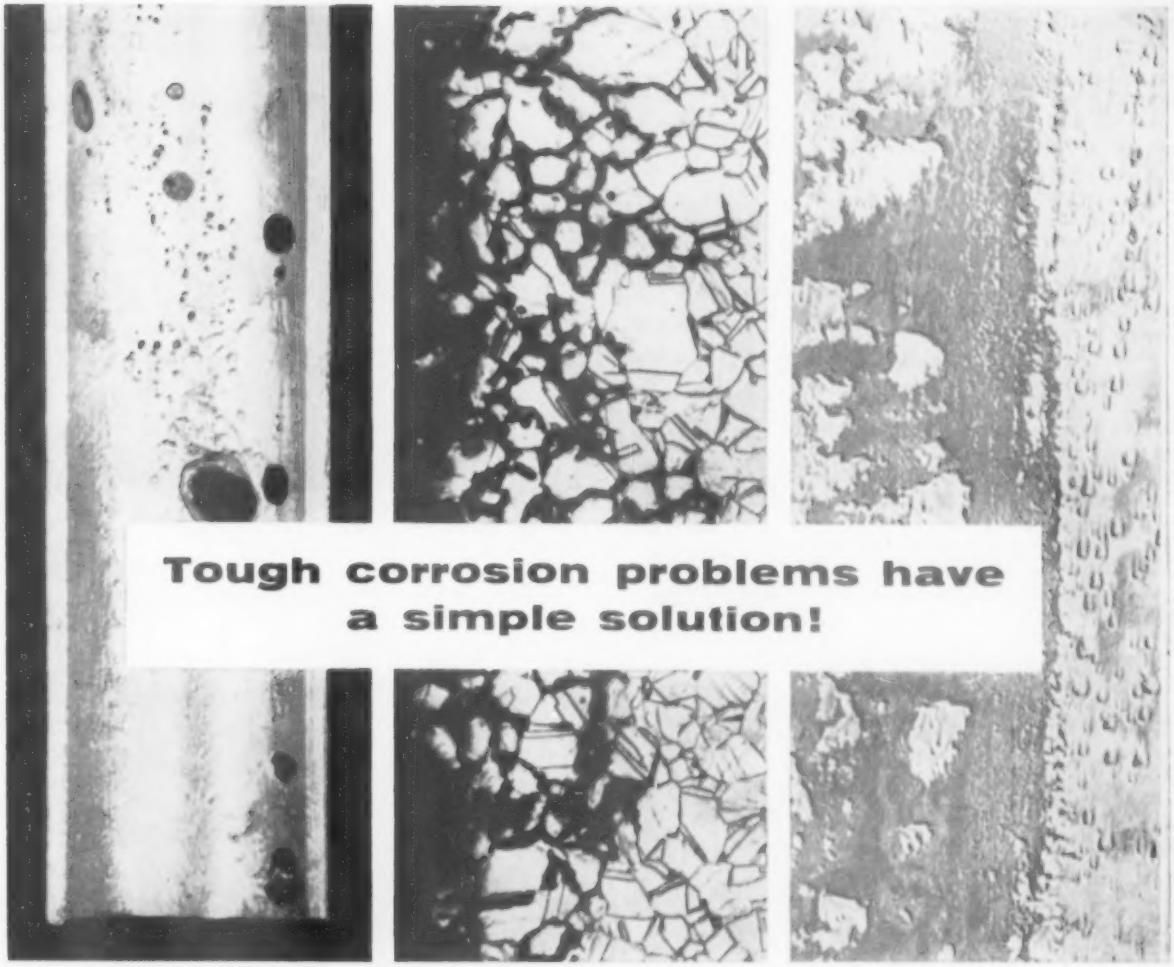
Author is consultant and staff member, school of petroleum engineering, University of Oklahoma, Norman.



PROPORTIONAL PILOT operated by gas allows variable valve positioning depending on controlled pressure. Fig. 1.



PRESSURE CONTROL for high pressure wells keeps constant separation pressure. Fig. 2.



Tough corrosion problems have a simple solution!

Dezincification

Since 1935, when it was first introduced by Chase, there has *never* been a reported dezincification failure of Chase Antimonial Admiralty tube—and over one-hundred and twenty million pounds have been installed in heat exchangers and condensers!

Intercrystalline Corrosion

Both Chase Antimonial Admiralty and Chase Cupro-Nickels are highly resistant to intercrystalline corrosion. Alloying elements are properly distributed, grain size carefully controlled, internal stresses minimized—throughout every length of tube!

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Even turbulent, high-velocity salt water flow is stymied from destructive cavitation in Chase Cupro-Nickel tube. These alloys form a tough protective oxide film on its surface that strongly resists those horseshoe-shaped impingement pits!

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which in turn necessitates a heavy spring.

In such cases the use of a pressure-loaded balanced diaphragm valve is indicated. With this type greater valve travel may be obtained, with less change of controlled pressure, than with any other type. With a constant loading pressure on a larger balanced diaphragm the available force to travel the valve with incremental change of control pressure is greater than a spring-loaded valve due to spring characteristics. However, spring loading is simpler wherever applicable.

The greater the pressure drop across a valve the greater the unbalanced force that exists. Where this pressure drop is greater than several hundred pounds per square inch it is good practice to install a choke nipple downstream from the valve. This choke nipple should preferably be about 10-25 per cent larger than the inner valve so that the latter is the controlling element.

The nipple serves two purposes: (1) It reduces the pressure drop across the valve and increases sensitivity, and (2) it acts as a secondary control in the event the valve fails to close or cuts out.

The pilot shown in Fig. 1 may be modified to give what is known as high-low shutoff. A pilot so modified will cause the valve to close if the controlled pressure becomes higher (or lower) than the preset condition. This modification has particular application in high-pressure wells to:

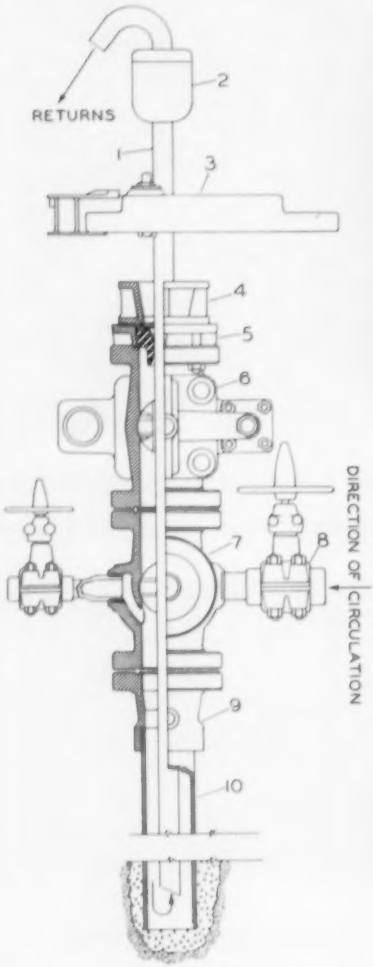
1. Shut in the well in the event a line break is encountered.

2. Prevent overpressuring of a separator or other piece of equipment downstream from a choke or valve.

Automatic choke . . . In some instances it is desirable to use an automatic rather than a manual adjustable positive choke. A regular diaphragm motor-valve topworks may then be combined with the choke body to give a control valve and choke combined. Although it costs more there is some advantage to using the positive choke as a rough control with a separate valve at the wellhead for safety.

Fig. 2 illustrates such a scheme where several wells are being flowed to a central low-temperature separation unit, the pressure drop being taken at the unit. The valve at the well protects against line break while the back-pressure valve at the separator holds the separation pressure constant regardless of how the sales line pressure varies. The two control valves fix the pressure drop across the choke with the flow rate being determined by the choke setting.

Where very high formation pressures are encountered one or more "storm chokes" in the well proper makes a desirable installation.

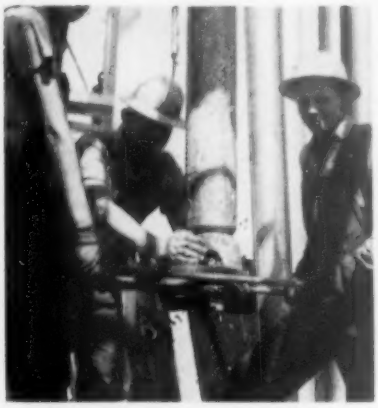


Tubing vacuum cleaner saves workover time

CONSIDERABLE time can be saved on work-over jobs by using the hook-up shown in the diagram together with reverse circulation during clean-out operations.

The numbered equipment is: (1) tubing; (2) swivel; (3) air tongs; (4) slip bowl of the tubing spider; (5) stripper, or circulating head; (6) ram-type preventer; (7) ram-type master gate; (8) wing valve; (9) tubing head; and (10) casing.

The relatively high velocity of flow in the tubing gives sort of a vacuum cleaner effect which removes more trash from the hole and does it faster than it can be done with direct circulation. Working the tubing up and down and rotating while circulating, help speed the operation.



BIT IS HELD in place for stabbing.

Bit holder is easily made

FUMBLING around with a heavy bit in order to stab it into drill collars is eliminated with this simple device. It is a bit holder made from a casing thread protector, a piece of plate steel and two pieces of pipe for handles.

Showing how the bit holder works are three crew members of Rig 15, of Eason Oil Co., Oklahoma City. While Ken Collins and John Shaw, roughnecks, hold the bit in place, Wayne Rice, driller, easily starts it into the drill collar. Since he doesn't have to cope with the weight of the bit, he finds it much easier to get the threads started right. And because the bit will rotate naturally within the bit holder, screwing it up tight is no trouble at all.

Any time a welder is handy on a rig, the bit holder takes only a few minutes to make. Just weld a round plate on the casing thread protector and then weld a piece of ½-in. pipe to each side.

S = $

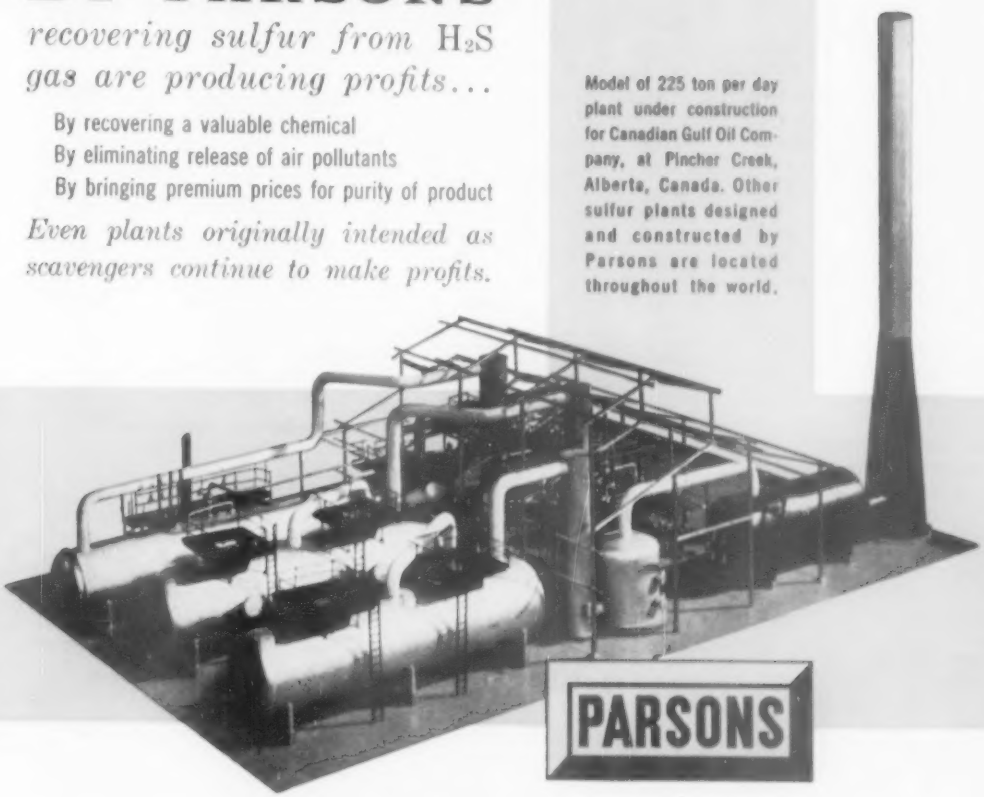
30 PLANTS BY PARSONS

recovering sulfur from H_2S gas are producing profits...

By recovering a valuable chemical
By eliminating release of air pollutants
By bringing premium prices for purity of product

Even plants originally intended as scavengers continue to make profits.

Model of 225 ton per day plant under construction for Canadian Gulf Oil Company, at Pincher Creek, Alberta, Canada. Other sulfur plants designed and constructed by Parsons are located throughout the world.



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by W. L. Nelson
Technical Editor

COST-imating

Many readers have asked us, so here's

How the Nelson Refinery Construction Index Is Computed

THE proportions between the amount of structural steel, plate steel, concrete, insulation, pumps, compressors, machinery, instruments, heat exchangers, electrical equipment, etc., for actual installations were tabulated for the several types of petroleum-refinery constructions, such as gas-recovery or natural-gasoline plants, atmospheric-distillation plants, high-pressure equipments, etc. Most materials items could be grouped under common headings such as steel or building materials, and other special equipment was grouped under the heading of miscellaneous equipment.

Inasmuch as the cost of finished steel or other finished equipment varies more widely than the prices of raw materials, each item of cost, whenever possible, was broken down into raw-material cost and the cost of the labor required to finish the raw material into machines, structures, or equipment, and such labor costs were added to the normal cost of assembling and erection. On such a basis, the cost items may be grouped as in the Nelson Index:

	Per cent
Materials component—	
Iron and steel	24
Building materials	8
Miscellaneous equipment	8
Labor component—	
Skilled construction	30
Common labor	30
Nelson Index	100

The basic year is 1946, and all current prices or costs are stated as the ratio of the current price to the 1946 price. The same ratio or index can be obtained from cost indexes for the current date and the year 1946. The 1946 costs of many items or equipment were tabulated in The Oil and Gas Journal issues of April 11, 1955, page 132; July 4, 1955, page 121; and October 3, 1955, page 146, but these issues were not aimed at an explanation of the Nelson Refinery Construction Cost Index.

The Index appears in the first issue each month in The Oil and Gas Journal in the form of a "box" such as the one shown on this page. Values of the Index and the several components since 1946 are indicated in a chart on page 121 of the January 9, 1956, issue of The Oil and Gas Journal.

Labor component . . . This is the average of labor rates in 20 American cities, obtained from Engineering News Record. Skilled labor is the average of three trades, i.e., bricklayers, structural-iron workers, and carpenters. As more and more labor-saving machinery is employed, the proportion between labor and material is expected to approach 55:45 at some date such as 1975 whereas a ratio of 66:35 more properly represented the situation during 1925 *(The Oil and Gas Journal, March 22, 1954, page 227).*

Materials component . . . Although only three groupings of materials are used in computing the materials component, the total number of items included in the average exceeds 190. Most of these are obtained from Bureau of Labor Statistics (wholesale prices) but some of the miscellaneous equipment costs are obtained from manufacturers. The entire list of items is indicated in Table 1.

TABLE 1
Materials Items Used in Nelson Refinery Construction Cost Index

Kind of materials—	No. of items
Iron and steel (Code 10-10)	
Iron and steel scrap	2
Semifinished steel—billets, rods, skelp, and alloy slabs	6
Finished steel—rails, spikes, bolts, concrete reinforcing rod, plates, structural, bars (tool steel), alloy bars, carbon steel bars, sheets, strip, pipe, boiler tubes, wire, nails, fencing, tin plate, etc.	43
Iron ore, delivered	2
Foundry and forge products—steel castings, drop forgings, smith forgings, gray iron, molds, chilled iron, and pipe	9
Pig iron and ferro alloys	7
Nonmetallic building materials (Code 13)	
Glass—plate, window, and safety	4
Concrete ingredients—cement, sand, gravel, and stone	4
Concrete products—blocks and pipe	3
Clay products—brick, tile, and pipe	9
Insulation, lime, plaster, asbestos, and roofing	13
Miscellaneous equipment	
Pumps and compressors (Code 11-41)	6
Electrical machinery (Code 11-7)—motors, transformers, switch gear, instruments, welding equipment, lamps, etc.	62
Diesel and gas engines (Code 11-54)	8
Heat exchangers	4
Instruments	9

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, Petroleum Refinery Consultant, Tulsa.
The Index was explained July 7, 1952 (page 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

	Index (1946 = 100)					
	1949	1952	1953	1954	1955	June 1956
Pumps compressors, etc.	135.9	155.6	162.5	166.5	172.2	192.0
Electrical machinery	130.9	152.4	156.4	160.0	162.5	173.7
Internal-combustion engines	124.8	146.5	148.1	150.5	153.2	162.5
Instruments	123.1	146.2	151.8	154.6	162.9	180.3
Heat exchangers	133.0	165.8	174.9	171.7	156.8	188.0
Miscellaneous equipment average	*121.6	153.3	158.8	160.7	161.5	179.3
Materials component	143.6	164.3	172.4	174.6	176.1	187.7
Labor component	137.1	163.1	174.2	183.3	189.6	198.4
Nelson construction index	139.7	163.6	173.5	179.8	184.2	194.1

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

by W. L. Nelson
Technical Editor

COST-imating

Wages Have Outstripped Materials Since 1952

DURING May, June, and July, the Materials Component (190 items) of the Nelson Refinery Construction Cost Index receded slightly (about 1 per cent), but with the recent increases in the cost of steel, the cost of materials is again expected to rise. Similar tendencies to recede occurred in July 1953 and December 1954, reaching a low in June 1955.

Material prices between 1946 and 1952 rose more rapidly than wages, the maximum difference occurring in January 1951 when materials stood at 163.5 (relative to 1946) and wages at 148.5. Since 1952, wages have increased very rapidly whereas materials costs have tended to remain steady. The maximum rewarding of labor occurred in June 1955 when labor stood at 189.5 and materials at only 171. When our society functions properly it provides wage increases at a faster rate than the increase in materials costs.

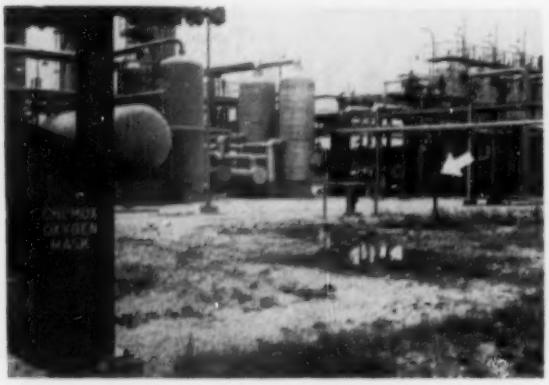
The cost indexes on this page may be used to convert prices known at any rate to prices at other dates or the present, by ratios of the cost indexes of the same dates. Similar Itemized Cost Indexes are published quarterly in the first weekly issues of January, April, July, and October. In addition, the Nelson Refinery Construction Cost Index is published in the first issue each month of The Oil and Gas Journal in the Engineering Section. (See opposite page.)

Itemized Cost Indexes

(Multiply the 1946 prices of the Cost-imating Series by these Index Numbers divided by 100.)

	1948	1950	1952	1954	1955	May 1956	References*	Index for earlier years (The Oil and Gas Journal) in Cost-imating issues
Labor:								
Skilled construction	125.0	140.0	157.9	174.6	179.8	185.7	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	151.0	148.1	168.2	192.1	199.4	207.9	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	128.0	144.0	163.1	183.3	189.6	196.8		No. 61—Dec. 15, 1949
Refinery operation	126.0	137.6	155.1	169.5	176.7	189.9	Sur. of Current Business	No. 55—Nov. 3, 1949
Refinery productivity, bbl. per employe	109.0	125.0	132.0	142.0	140.0	146.0		
Equipment or materials:*								
Arc-welding machinery			151.3	158.4	163.8	179.2	Code 111-76	May 2, 1955§
Boilers, tanks, and sheet metal	†140.0	†136.0	†153.4	147.3	150.3	165.5	Code 10-72	April 21, 1952§
Boiler tubes, 2-2¼ in.	131.3	149.5	168.8	199.4	211.2	231.2	Code 10-14-61	Sept. 5, 1955§
Building materials (nonmetallic)	120.6	127.0	134.8	143.6	149.4	152.8	Code 113	No. 22—Mar. 17, 1949
Brick—building	122.8	132.5	140.6	144.7	150.5	158.4	Code 13-41	No. 20—Mar. 3, 1945
Brick—fireclay	133.3	153.4	167.1	193.1	205.9	213.1	Code 13-42	May 30, 1955§
Castings (foundry products)	144.6	152.9	168.0	181.1	185.1	200.1	Code 10-15	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	121.3	134.6	145.8	159.1	167.4	174.6	Code 13-4	No. 20—Mar. 3, 1949
Concrete—ingredients	119.4	125.3	132.7	142.1	146.6	152.7	Code 13-2	No. 22—Mar. 17, 1949
Concrete—products	118.9	124.4	132.6	138.5	139.8	143.5	Code 13-3	
Electrical machinery	127.6	134.9	152.4	159.9	162.5	171.8	Code 111-7	May 2, 1955§
Electrical motors and generators	128.6	135.0	154.6	157.7	157.1	166.8	Code 111-73	No. 31—May 19, 1949
Electrical switchgear			161.4	171.2	176.5	188.8	Code 111-75	May 2, 1955§
Electrical transformers, etc.	127.0	131.6	148.0	161.9	161.8	171.0	Code 111-74	No. 31—May 19, 1949
Engines (composite)	116.9	126.0	146.5	150.5	153.2	162.5	Code 111-54	No. 36—June 23, 1949
Exchangers	130.0	140.0	165.8	174.5	156.8	188.0	Manufacturer	No. 2—Oct. 28, 1948
Fans and blowers	131.3	162.9	183.7	192.6	199.7	218.0	Code 11-47	Feb. 17, 1949§
Hand tools	125.2	143.2	155.1	173.8	185.7	196.2	Code 10-42	June 27, 1955§
Instruments (composite)	120.0	127.8	146.2	154.6	162.9	180.3	Manufacturer	No. 34—June 9, 1949
Flow meter (mechanical)		114.0	132.3	161.6	177.2	203.3	Manufacturer	No. 34—June 9, 1949
Flow meter (air control)		138.5	160.5	179.6	188.6	203.1	Manufacturer	No. 34—June 9, 1949
Flow meter (remote)		135.5	155.2	146.5	153.5	170.2	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point		134.0	151.5	167.2	178.6	208.3	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control		134.1	144.9	150.5	164.0	190.2	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder		135.6	158.4	166.3	169.1	187.1	Manufacturer	No. 34—June 9, 1949
Pressure gage		101.2	108.6	108.6	112.1	119.2	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)		124.0	149.4	152.8	156.5	170.2	Manufacturer	No. 34—June 9, 1949
Control valve		133.3	155.5	162.0	166.8	171.5	Manufacturer	No. 34—June 9, 1949
Insulation materials	126.8	125.0	130.4	135.5	131.8	124.5	Code 13-72	
Lumber (composite)	181.0	193.0	203.2	197.8	209.7	220.0	Code 8-1	No. 7—Dec. 2, 1949
Lumber (Southern Pine)	174.3	176.9	191.2	181.2	188.4	196.8	Code 8-12	No. 7—Dec. 2, 1949
Lumber (other soft woods)	206.5	230.2	248.5	252.7	265.1	272.5	Code 8-13	
Machinery—general purposes	124.9	136.7	151.8	159.9	166.8	181.3	Code 11-4	Feb. 17, 1949§
Machinery—construction	127.8	140.1	157.5	165.9	172.5	184.7	Code 11-5	
Machinery—oil field	†125.9	†135.8	†149.9	†161.9	†168.5	176.1	Code 11-51	Oct. 10, 1955§
Paints—prepared	141.4	140.0	155.7	159.0	161.4	167.9	Code 6-21	May 16, 1955§
Pipe, sewer	110.9	120.7	136.9	140.1	149.9	160.4	Code 13-45	No. 22—Mar. 17, 1949
Pipe, black iron	141.0	160.0	179.0	195.0	204.0	207.1	Code 10-14-56	
Pumps, air compressors, etc.	127.0	138.2	155.6	166.5	177.2	189.7	Code 111-41	No. 29—May 5, 1949
Steel (iron and steel)	141.1	152.9	168.5	179.6	189.9	203.7	Code 10-1	No. 61—Dec. 15, 1949
Steel—finished steel	135.7	153.7	170.0	187.1	196.0	207.1	Code 10-14	July 25, 1955§
Steel—plate and sheet			(See boilers, tanks, etc., above)					
Steel—structural shapes	145.0	162.7	176.2	193.4	204.3	211.8	Code 110-14-31	No. 18—Feb. 17, 1949
Valves and fittings	†125.9	†135.8	190.8	197.1	208.6	234.4	Code 111-49 (1-6 & 11-14)	No. 46—Sept. 1, 1949
Nelson Refinery Construction	132.5	146.2	163.6	179.8	184.2	193.5		No. 61—Dec. 15, 1949

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices." †Estimated base value for 1946. ‡Not exactly the same items as those published before July 7, 1952. §Questions on Technology, The Oil and Gas Journal.



TURRET NOZZLES (arrow) and hose-reel stations plus oxygen equipment are placed close to the extraction unit, where 400 M.M.c.f.d. natural gas is processed.

EMPLOYES receive fire fighting training and actual practice. These men are wearing Chemox breathing apparatus and speaking diaphragms. (Photos from Mine Safety Appliances Co.)

Petrochemical plant makes principal product—SAFETY

CORRECT training methods conducted by National Petro-Chemicals Corp., Tuscola, Ill., for maximum safety protection have given this firm extremely good results.

In addition to classroom and film sessions, fire training is carried on weekly at a demonstration set up in an area of the plant safely distant from processing equipment. The limestone-covered area is approximately 90 by 100 ft., with a centrally located, 400-sq. ft. concrete pad.

There is a steel tank 15 ft. in diameter and 4½ ft. high in which various types of oil fires are ignited. Other practice provisions include a gasket-failure manifold pipe 10 ft. high; a jet burnoff piping set up 3 ft. above grade, and arrangements for simulating trench fires.

To facilitate the fire-fighting plan, the entire plant area is divided into eight zones, identified numerically. Alarms are transmitted by dial telephone to guard headquarters over an extension reserved exclusively for reporting fires.

On receipt of an alarm, the guard immediately actuates five large sirens as a warning signal. Then, through an automatic instrument panel, the number of the zone in which the fire is located is blasted out on the generating station's steam whistle.

When the alarm sounds, designated personnel from each operating zone immediately respond. Normally, 10 to 12 men, trained in fire fighting, answer every alarm. In the event of a major disaster, a master emergency plan would go into operation. With this plan, rescue and overhaul work is included. Any man in the plant may be called upon to assist the designated personnel in fighting fires.

Well-equipped station . . . National Petro's fire station is as modern as one would find in any well-equipped community. Included in the brick structure are a hose-drying tower, storerooms for supplies, extra ladders, training facilities, and other essentials.

A multipurpose fire truck was specially designed for the company. It is built around a two-stage centrifugal pump. Pump specifications are 500 g.p.m. at 120 psi. net pressure, 250 g.p.m. at 200 psi., and 167 g.p.m. at 250 psi.

The engine carries 500 gal. of water in its booster tank and a normal load of 2½ and 1½-in. hose, latter being preconnected to discharge outlets for rapid use. A turret nozzle with 360° horizontal travel, is mounted behind the cab and three tip sizes are available for use.

A 50-gal. tank of foam liquid is carried and the foam proportioner is built directly into the piping system. A four-wheel trailer with additional drums of foam solution is kept in the fire station.

An important feature of the fire apparatus is its provision for quickly applying dry chemical on a fire. A ton of dry chemical—carried on the truck—can be expelled on a fire in 2 minutes 9 seconds, using nitrogen as the expellent. One 150-ft. length of chemical hose with shutoff nozzles is carried on each side of the vehicle. A full complement of other equipment, including four 30-lb. dry-chemical extinguishers, is included on the truck.

The fire-patrol truck carries small extinguishers for different classes of fires, and an assortment of emergency rescue equipment. A 500-lb. dry-chemical unit mounted on a trailer will be delivered to the plant shortly.

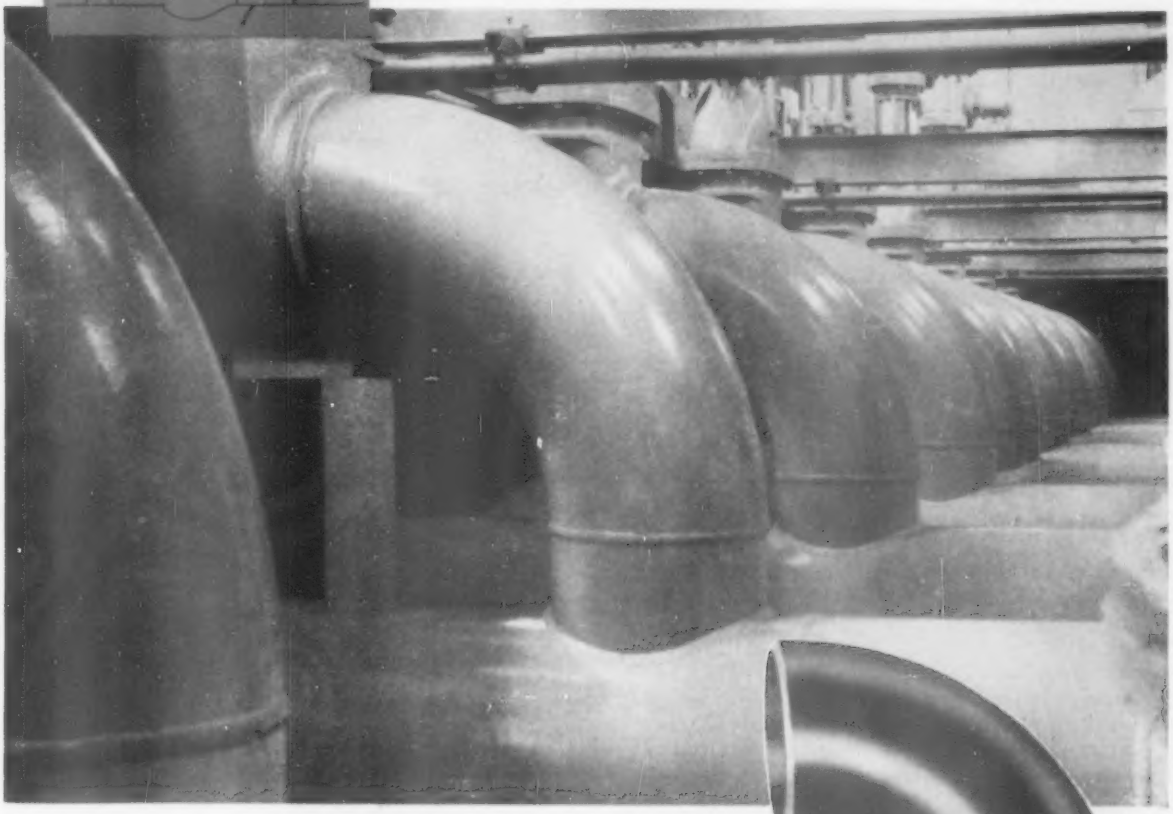
Water supply . . . Fire hydrants are located throughout the plant area. The fire water-main system is supplied from a nearby 25-acre artificial lake that has a storage capacity of 100 million gallons. Although the fire service lines, mostly 10-in. mains, are independent of domestic and process lines, they are crossconnected with the process water system so cooling water can reinforce the fire supply.

The main fire pump is a 1,500-g.p.m. (276-ft. head) gasoline-driven, multistage unit taking suction at the lake. Three of the cooling towers have electrically driven 500-g.p.m. pumps which help supply the fire system.

In the process areas—such as the extraction unit, alcohol plant, fractionating unit, etc.—there are 14 strategically located quick-acting hose-reel stations. Each station contains 250 ft. of 2½-in. hose.

Because of the wide and varied nature of gases and chemicals used and produced at the plant, fire-fighting crews are trained to identify the gas involved. Each process produces certain known gases and appropriate breathing apparatus or masks are provided to protect against them. Some different gases, however, are evolved

These B&W Elbows Need Less ELBOW ROOM



ELBOW room was at a premium in this piping manifold. Fabricators chose B&W Fittings because they're easy to install, especially in a job like this which calls for "close-quarter" welding. Installation went ahead fast and without trouble, thanks to the accurate dimensions of the B&W Welding Ells used.

Maintenance, too, will be kept at a minimum because, with a sound weld, piping is permanent and leakproof. B&W Seamless Welding Fittings and Flanges are available in a complete range of grades, types, sizes and pipe schedules.

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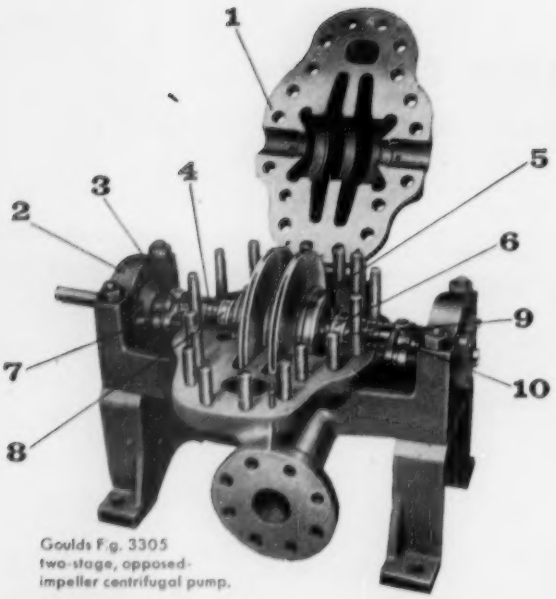

Goulds F.g. 3305
two-stage, opposed-
impeller centrifugal pump.

10½ reasons why you should buy this compact two-stage pump

You can save space by installing a pump that's got built-in compactness—and Goulds Fig. 3305 has got it.

Compactness!—That's just the ½ of it!

In addition to saving on overall length when compared to conventional designs, you'll avoid the usual maintenance headaches. Here are *10* other extras—*standard* on this two-stage centrifugal pump—which make this possible:

1. You can inspect, clean, and remove the entire rotating element without disturbing suction and discharge piping or pump and driver alignment.
2. Moisture and dust can't get through sealed bearing housings.
3. You can use quenching liquids with these cowl-type glands.
4. Stuffing box packing is die-formed.
5. Impeller rings are stainless steel.
6. A unique patented device—locking shaft sleeves—permits changing of rotation in the field without construction changes.
7. Gland bolts are corrosion resistant.
8. Teflon water seal rings.
9. Renewable stuffing box bushings.
10. Either conventional stuffing box with gland or a mechanical seal can be used. Changing from one to the other can be done in the field.

These features are usually "extras"—but you pay Goulds no more for any of them. They're *standard* on the Fig. 3305.

Learn more about this compact two-stage, opposed-impeller pump. Drop us a line and ask for Bulletin 722.6.

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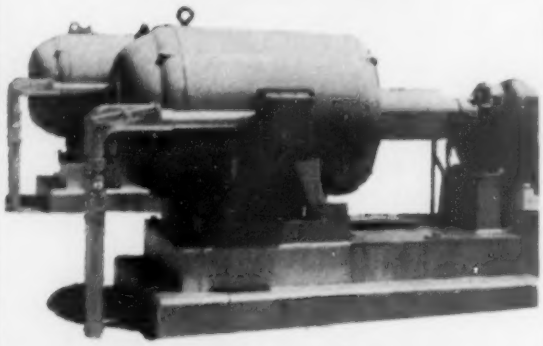
EXPLOSION PROOF MOTORS



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- FIELD-PROCESSING PLANTS
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This new edition of The Journal's Annual Directory brings you the results of six recent surveys of the processing side of the oil and gas industry. The surveys cover installations in the U. S. and Canada. It brings you the facts.

- A statistical summary arranged alphabetically by state and company which gives you the names, capacities, and processes.
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- In addition to the plant-by-plant surveys you get the names of over 6,500 key executive and operating personnel.

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THE OIL AND GAS JOURNAL
Box 1260 Tulsa, Oklahoma

PROBE TUBE is used with M-S-A Explosimeter to check for combustible gases. In hazardous areas motor vehicles are not permitted.

PORTABLE OXYGEN EQUIPMENT is readily available. N. Wayne Walkup, safety inspector, demonstrates one of the units during training.

when known gas contacts hot metal or flame.

For example, if a chlorinated hydrocarbon comes in contact with flame it produces deadly phosgene gas. Therefore, because it frequently is difficult to determine readily what type of toxic gas or vapor may be encountered in an emergency, the Chemox apparatus is used most of the time. This equipment, unlike a gas mask which filters air through a canister, makes the wearer independent of the atmosphere surrounding him.

Chlorine and benzene are two of the most toxic products at the plant. Gas masks, with interchangeable canisters for various types of vapors and gases, are provided when required for production or emergency use. Employes working in the areas where chlorine is stored or handled carry small, compact pocket-type respirators which can be put on quickly for protection against low concentrations of acid gases and vapors long enough to permit escape in an emergency. These appliances have replaceable cartridges.

At the chlorine-tank-car unloading spur, employes wear air-supplied respirators when breaking connections on the cars. Air is piped to the unloading platform and workmen can plug the mask hose line into outlets with quick-connecting valves. The line is equipped with pressure reducer and filter. If the air-line respirator is not used, a gas mask with Bureau of Mines approved canister for chlorine protection is worn.

Every employe in the plant operating area is required to wear a protective hat and safety glasses. Visitors and outside contractors also are provided with this equipment.

Gas hazard . . . In recognition of the gas hazard with respect to inhalation by personnel, the company provides several instruments to administer artificial respiration automatically. The portable units are Pneolators, with auxiliary attachments for treating more than one victim simultaneously. Pneolators administer artificial respiration automatically with intermittent positive pressure, an important consideration if the victim has inhaled irritant gases like chlorine which may produce pulmonary edema. In the central dispensary and at the chlorine unloading area, Demand Pneophores are kept available to treat gas inhalation cases. These instruments operate on the same principle as the portable Pneolator.

Gases and materials with low flash points are a common and continuing hazard at National Petro-Chemical. The lowest ignition temperature of the materials is 356° F. for ethyl ether. Three of the principal materials have ignition temperatures below that of the process steam lines which snake through the plant. Steam temperature is 750° F. and it is under 600 psi. pressure.

Frequent tests are made throughout the plant with portable Explosimeters which detect combustible gases. These instruments also are used to check tanks and piping before any welding or other work is permitted in the vicinity. Special fire and safety permits for hot work are made out in triplicate, and all possible hazards are surveyed before the safety inspector and the area supervisor authorize the work to proceed. Departmental work permits also are issued for jobs that require opening lines or equipment, altering the operation or function of operating equipment, creating a potential hazard in an operating area, or necessitating craftsmen to be in restricted locations within process equipment while it is in operation. Copies of these work permits go to the safety department.

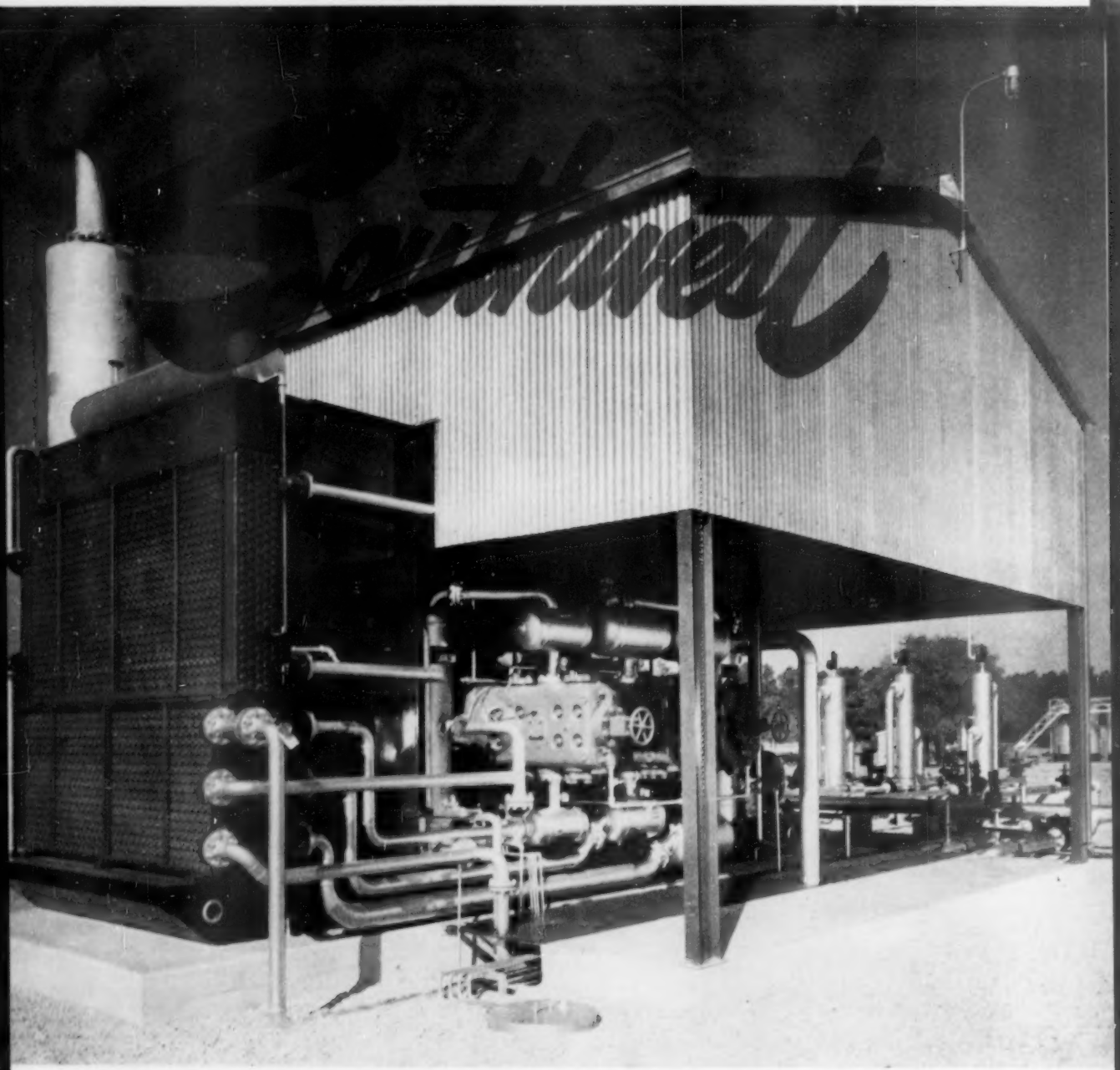
Explosimeter tests . . . In some areas of the plant, Explosimeter tests are made before any autos or trucks are permitted to enter. The inspector, wearing the instrument, probes the ground and nearby pipes and equipment in advance of the vehicle.

Another important function of the Explosimeter is to check the service vault of an underground propane-storage cavern before men enter the vault for inspection.

The plant also uses a new type of instrument—the Aromatic Hydrocarbon Detector—to determine toxic concentrations of benzene and toluene, both of which are used and stored. The small, hand-operated aspirator-bulb instruments have three separate calibrations for aromatic hydrocarbons and quickly give readings in parts per million concentrations. They are used for routine spot checking and special testing of aromatic-hydrocarbons tanks, lines, and pumps.

Control rooms for the seven major processing units in the plant each are air conditioned and, to assure that no combustible fumes or vapors leak into the system, M-S-A Combustible Gas Alarms are used. The alarm continuously samples air being introduced into and recirculated through the air-conditioning system to detect the presence of combustible concentrations. If the air is contaminated, the alarm automatically actuates an audible signal in the control room which is manned continuously.

To gas free tanks and towers or to cool down the ethane-cracking furnaces for repairs, venturi-type air movers are employed. The air movers, operating with compressed air, have no moving parts but handle tremendous volumes. The ethane-cracking furnaces, for example, operate at temperatures exceeding 1,400° F. and cooling them down for repair work with ordinary blowers used to require 16 hours. Now, by installing one air mover at the top of the furnace to suck air out and another at the bottom to force air in, the unit can be cooled in only 8 hours.



DESIGNS, ENGINEERS and BUILDS COMPLETE PACKAGED GAS COMPRESSOR PLANTS

Southwest erects complete gas compressor plants: engineering, compressors, building, on one purchase order and with single responsibility from beginning to end. Southwest does the complete job in building compressor stations afloat, on platforms, or on land giving you faster delivery, lower *installed* cost, and undivided responsibility.

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Among the

Drilling Contractors

Milton Crow, Inc., Shreveport, has contracted for a deep test to be drilled for State Oil Co., also of Shreveport, off the west flank of Blackburn field, in Claiborne Parish, North Louisiana. The test, 1 Tinsley, in 19-22n-8w, will be carried to the Cotton Valley-Bodcaw sand about 9,000 ft. Its location is a mile west of nearest production in the field.

Ace Drilling Co., Dallas, has two additional wells under contract for Thomas D. Humphrey & Sons in South Slocum field, 3 miles southeast of Slocum, in Anderson County, East Texas. Both are 6,200-ft. Woodbine jobs, one at 2 Gibson, and the other at 2-A Wallace. Both are in the W. T. Sadler Survey.

Jack Halbert Drilling Co., Kilgore, Tex., has a new operation under way for Lone Star Producing Co. in Buffalo field, 7 miles southeast of Buffalo, in Leon County, East Texas. It is a 6,000-ft. Woodbine well at 2 Duncan, in the James M. Webb Survey.

Rowan Drilling Co., Houston, contracting for Tidewater Oil Co. in Venice field, in the Mississippi River delta marshes of Plaquemines Parish, Louisiana, is getting under way on another ultra deep test. It will be Tidewater's 91 Buras Levee District, scheduled as a 17,000-ft. operation. Location is off the north flank of the dome, around which several such tests have been drilled.

Riggs Drilling Co., Shreveport, is keeping a rig working for J. C. Mayfield, of Shreveport, in Joaquin field, 2 miles southeast of Joaquin, in Shelby County, East Texas. It currently is on Mayfield's 1 Pickering, a 4,000-ft. job, in the P. W. Donahoe Survey.

Grady Roper Drilling Co. is on another General Crude Oil Co. and Harry Hunt job in Cowards Gully field, on the Beauregard-Calcasieu parish line, northwest of DeQuincy, southwestern Louisiana. It is the operator's 4 Lutcher-Moore, in 15-7s-11w, contracted for 9,650 ft. The field was opened a year ago with gas production from a 4,700-ft. Frio sand, and oil production from a 9,200-ft. Yegua pay.

Ray Holbert Drilling Co. has a new contract operation in Hopkins County, East Texas. It is a 7,000-ft. test for Andrew V. Erwin and associates at a wildcat location, 1 Bassham, in the David Hopkins Survey, 3 miles southeast of Sulphur Bluff.

Penrod Drilling Co., Shreveport, has contracted for another well Bel Oil Corp. has scheduled for the North Elton area, in Allen Parish, southern Louisiana. Location is at 1 Huber and

DOUBLE CREW on a rig Shore Line Drilling Co. has been operating under contract for Southern Natural Gas Co. in the Plumb Bob area, 16 miles south of Lafayette, in St. Martin Parish, Coastal Louisiana. Back row, left to right: W. K. Morphis, tool pusher; H. A. Griffin, driller; R. W. Coleman, derrickman; B. I. Welborn, engineman; F. D. Reno and B. J. Landos, floormen; and C. J. Bourque, mechanic. Front row, same order: D. J. Owens, driller; C. J. Breaux, derrickman; A. J. Owens, engineman; H. J. Guidry and J. W. Foreman, floormen.

STOP LEAKS

It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 & 50 lb. cans. Unconditionally guaranteed.

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W. M. "Mack" Ault of Delta Gulf Drilling Co. now buys Mudwonder Mudline Valves to cut maintenance.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.

"Universal" Aptly Describes Range of Applications of BAKER Retainer Production Packer

Baker Retainer Production Packer
Product No. 415-D

Baker Locator Tubing Seal Assembly
Product No. 442-E2

ADVANTAGES of the Baker Retainer Production Packer:

1. *Forms positive, leak-proof pack-off against any pressure differential from either above or below the packer that is safe for the casing.*

2. *Pack-off achieved without excessive set-down tubing weight, or tubing in tension.*

3. *Permits tubing string to be anchored to the packer, released from the packer, or completely removed from the packer, all at the discretion of the operator.*

4. *Complete removal of the tubing string from the packer will not disturb the isolation of the zone below the packer, provided the pressure differential is from below the packer.*

5. *Pack-off remains leak-proof under conditions of high temperature, even under pressure differentials that exceed the safety limits of the casing.*

6. *Can be set on wire line, tubing or drill pipe.*

In practically every production application the Baker Retainer Production Packer has earned the designation "Universal" Type; and it appears also to be the answer to many future production problems.

The range of applications is further broadened by its ability to hold high pressures from above or below—at record or shallow depths—even under temperatures in excess of 300 degrees Fahrenheit.

Because it can also be used successfully as a squeeze tool, it is ideal for testing, acidizing, formation fracturing, squeeze cementing, and other operations required in the completion or work-over phases of a well.

The following actual field records of general production, as well as supplemental applications of this "Universal" Type Packer may indicate a solution to your well problems:

PRODUCTION APPLICATIONS

Single-Zone Production—More Baker Retainer Production Packers are used for single-zone production than for any other application—proof of their increasing and widespread usage in a field previously dominated by retrievable type packers.

Dual-Zone, Single-Packer Application—The majority of dual-zone applications of the Baker Packer are single-packer, dual-zone installations. Because of its remarkable ability to maintain the absolute separation of two zones, this packer is widely known and accepted as the ideal dual-zone packer.

Dual-Zone Production (Baker Selective Hook-Up), Two-Packer Installation—This efficient hook-up enables the operator to produce (pump or flow), treat (formation fracture, acidize, etc.), or test either zone selectively through the tubing, while simultaneously producing the remaining zone through the annulus. The switch in flow, or selection of a zone for treatment, is accomplished at the discretion of the operator, using an instrument line.

Permanent-Type Well Completions—Long recognized as the world's most permanent production packer, the Baker Retainer Production Packer was accepted early in the development of this new completion idea as OUTSTANDINGLY FIRST for Permanent-Type Well Completions.

Parallel Tubing Installations—When a *single* packer is used, each tubing string can be run or pulled independently of the other, and by using a special Anchor and a Latching Sub, the short string can readily be anchored to the long string.

When *two* packers are used, each string is run or pulled separately, however, the long string must be *run* first, and the short string *pulled* first. Either the single-packer or the two-packer installation features a full opening to the lower zone for use of all permanent completion-type tools.

Off-Shore Installations—The Baker Packer is used in conjunction with a storm choke to prevent loss of production due to accidental damage to surface connections of off-shore installations. Permanence, plus the ability of the packer to hold mud weight above the packer are additional factors that recommend its use in this application.

SUPPLEMENTAL APPLICATIONS

In addition to its use in practically every type of production application, the Baker Retainer Production Packer can also be used effectively as a squeeze tool in the following wide variety of "Supplemental" applications that might be required in the completion or work-over phases of a well:

Testing—As many as ten Baker Packers have been used in a single well for an efficient, complete bottom-to-top testing program. Ability of the packer to withstand reverse in pressure differential from high-pressure acid squeeze to swabbing enhances its use as a successful testing tool.

Acid Squeeze, Formation Fracture, or Squeeze Cementing—Use of the Baker Packer as a squeeze tool in either the initial completion or during subsequent work-over is widespread, due to elimination of the unnecessary additional expense of running a separate squeeze or testing tool.

Water Flood or Gas Injection—The permanence of the Baker Retainer Production Packer, plus the advantage of a free tubing string, make it a superior packer for secondary recovery instal-

lations. The packer has also been used in dual-zone wells where one zone is produced, with simultaneous injection into the other.

Isolation of Annulus—The Baker Packer is corrosion resistant. This feature, plus the fact that the packer permits removal of the production string without disturbing the isolation of the zone below the packer (pressure differential must be from *below* the packer) make it an ideal packer for use in corrosive areas where protection of the casing above the producing zone is of great importance.

Bridge Plug, Temporary or Permanent—The Baker Packer acts as a one-way bridge plug whenever the tubing is removed from the well, provided the pressure differential is from below the packer. It can easily be converted to a temporary two-way casing bridge plug or a permanent bridge plug.

POPULAR APPLICATIONS OF: the Baker "Universal" Type Retainer Production Packer

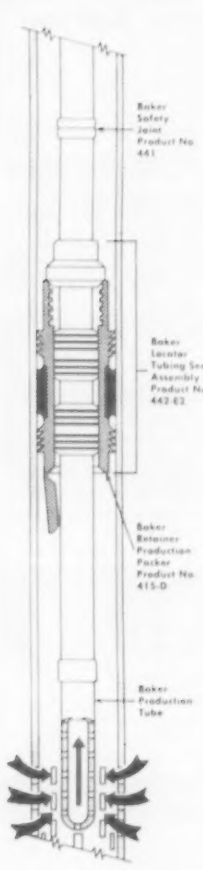
Baker Safety Joint Product No. 441
Baker Locator Tubing Seal Assembly Product No. 442-E2
Baker Retainer Production Packer Product No. 415-D
Baker Production Tube

Fig. 1

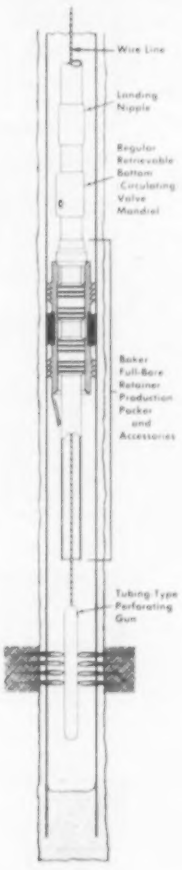
Wire Line
Landing Nipple
Regular Retrievable Bottom Circulating Valve Mandrel
Baker Full-Bore Retainer Production Packer and Accessories
Tubing Type Perforating Gun

Fig. 2

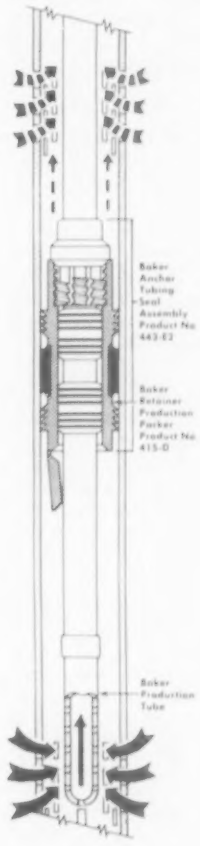
Baker Anchor Tubing Seal Assembly Product No. 443-E2
Baker Retainer Production Packer Product No. 415-D
Baker Production Tube

Fig. 3

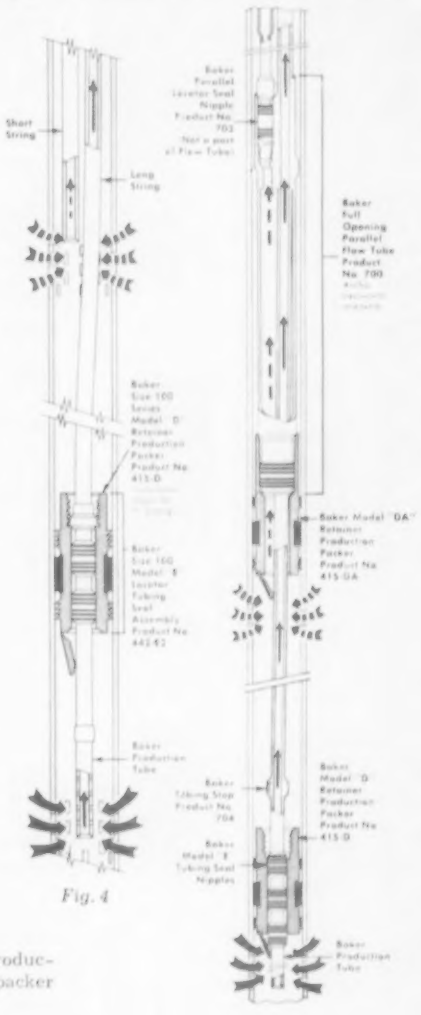
Short String
Long String
Baker Full Opening Parallel Flow Tube Product No. 700
Baker Size 100 Series Model "D" Retainer Production Packer Product No. 415-D
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Baker Size 160 Model "B" Locator Tubing Seal Assembly Product No. 442-E2
Baker Production Tube
Baker Tubing Stop Product No. 704
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Model "B" Tubing Seal Nipples
Baker Production Tube

Fig. 4

Fig. 5

SINGLE-ZONE Fig. 1.—Illustrates Packer set in casing with Locator Tubing Seal Assembly and Production Tube installed for single-zone production.

PERMANENT-TYPE WELL COMPLETION Fig. 2—Illustrates typical Permanent-Type Well Completion Hook-Up showing perforating operation through and below the packer.

DUAL-ZONE, SINGLE PACKER Fig. 3—Illustrates Packer set in casing with anchored production string for dual-zone production. Tubing can be released from packer by rotating to right.

DUAL-ZONE, PARALLEL STRINGS, SINGLE PACKER Fig. 4—Illustrates the simplest form of parallel string installation. A variation permits anchoring short string to long string, if desired. Note full opening to lower zone for use of all permanent completion-type tools.

DUAL-ZONE, PARALLEL STRINGS, TWO PACKERS Fig. 5—Illustrates two-packer parallel string installation with each zone confined to its individual tubing string, with full opening to lower zone for use of all permanent completion-type tools.

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others, in 24-6s-3w. Contract is for 8,700 ft. Penrod's rig currently is on Bel's 2 Buller-Langley Unit 1, a 10,700-ft. test, now nearing its contract objective. **Circle Drilling Co.,** Lake Charles, also has a rig working for Bel in that field.

Longhorn Drilling Corp., Three Rivers, Tex., has contracted to drill a 9,000-ft. wildcat test for Finley Co., of Reno, Nev., at its location for 1 Gardner-State in the Gyp Hill area, 7 miles southeast of Falfurrias, in Brooks County, South Texas. Rig will be moved in as soon as roads are completed.

Lee Daniel Drilling Co. is under contract for two wells to be drilled for Occidental Petroleum Corp. in the northern sector of the old Dominguez field, 25 miles below Los Angeles, in the Long Beach area of Los Angeles County, California. Drilling is getting under way on the first well, 2 Wadley-Rehers, projected to the eighth and ninth Callender zones.

Coulston Drilling Co., Gladewater, Tex., is on a new contract job for Grelling Estate and American Liberty Oil Co. in Good Omen field, 1¼ miles south of Arp, in Smith County, East Texas. It is the operators' 1-A Arnold, in the M. Henriquez Survey. Contract calls for 8,400 ft.

Livermore Drilling Co., Lubbock, Tex., has the contract on another deep test Pure Oil Co. is putting down in the new Devonian area, 3 miles northeast of Gladiola field, in northeastern Lea County, Southeast New Mexico. Location is for 2 Wallace, in 31-11-38. It is set up as a 12,000-ft. well.

Mast Drilling Co. has a new contract operation in Barger field, 10 miles northwest of McCook, in the northwest corner of Red Willow County, southern Nebraska. It is the second well for M. P. Gilbert, who discovered the field last spring with a Lansing-Kansas City producer at 3,850 ft. This is the only field on the Nebraska side of the Cambridge arch. The new operation is at 1 Potthoff, in 6-4n-30w.

Nicklos Drilling Co., Houston, has contracted for another deep test Austral Oil Exploration Co., H. L. Hawkins, and George McGhee will drill on their MacDonnell lease, in the South Lake Arthur area, in northwestern Vermilion Parish, coastal Louisiana. The new test (2 MacDonnell) is 1,320 ft. north and 2,730 ft. west of the lease's initial test being completed in a 15,000-ft. gas-condensate sand. Permit calls for a 16,500-ft. test.

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Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Buckeye Pipe Line Co.—Will complete in October or November 1956, own reconditioning of 191 miles of 8-in. from Griffity, Ind., to Lima, Ohio.

Fulton, R. H. & Co., Lubbock, Tex.—Has applied to Wyoming Public Service Commission to build 20 mile 6-in. line from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line. (Application competes with that of Powder River Pipeline Co.)

• **Gulf Oil Corp.**—Will build 33 miles of 8-in. from Citronelle field to Mobile, Ala.; completed.

Lakehead Pipe Line Co., Inc.—Anderson Brothers Corp. has under way 51 miles of 26-in. looping from Viking to Plummer, Minn., to complete August 31, 1956. It is in conjunction with 69 miles of 24 and 26-in. to be completed this summer by Interprovincial Pipe Line Co. (See Interprovincial, foreign crude.)

• **Magnolia Pipe Line Co.**—Plans 36 miles of 12-in. from Andrews to Midland, Tex., to be completed January 1, 1957.

Northwest Pipeline Corp. (an affiliate of Pacific Northwest Pipeline Corp.)—Will build 350 miles of 8-in. crude and products line from Four Corners area to Salt Lake City, to be completed August 1957.

• **Offshore Gathering Corp., Houston.**—Proposes 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana.

• **Pasotex Pipe Line Co.**—Plans 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section, to complete July 31, 1957.

• **Powder River Pipeline Co.**—Fratt Building, Billings, Mont., plans a 20-mile, 6-in. line from Donkey Creek field near Moorcroft, Wyo., to Butte Pipe Line Co.'s line.

• **Shannon Oil Co., Denver.**—Plans with Farmers Union Central Exchange, Inc., and Mule Creek Oil Co., both of Billings, Mont., a 34-mile, 6-in. line from Murphy Dome in Hot Springs County, Wyoming, to contact Ohio Oil Co.'s line in Big Horn County. Construction to start in August, end by December 1, 1956.

• **Shell Pipe Line Corp.**—Has let contract for 41.5 miles of 10-in. from Shell's Houston refinery to Brookshire Station, to complete by December 1, 1956. Bill Murry is spread superintendent for Bill Murry & Co., contractors. Spread office: 12629 South Main, Houston 25, Tex.

• **Sinclair Pipe Line Co.**—Plans 150 miles of 20-in. from Teague, Tex., to Houston.

• **Tecumseh Pipe Line System.**—190 miles of 20-in. will be built by Sinclair Refining Co., Pure Oil Co., Ashland Oil & Refining Co., between East Chicago and Cygnet, Ohio, to be completed September 1957.

• **Union Oil Co. of California.**—Proposes 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.

Will build 225 miles of 16-in. from San Joaquin Valley to its refinery at Oleum, Calif., to be completed late 1957.

Products Pipelines

• **American Pipe Line Co.**—Received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line from Gulf Coast area to New York City area.

• **Cities Service Oil Co. & Subsidiaries.**—Plans a 10-mile, 6-in. L.P.G. line from Maysville to near Pauls Valley, Okla., to tie in to Shell line moving on to Cushing, Okla.

• **El Paso Natural Gas Co.**—Plans 240 miles of "larger than 6-in." to carry natural gasoline, butane, and propane, from its Midkiff natural-gasoline plant in Permian basin, Midland County, to El Paso.

• Will build 38-mile, 4-in. line from Wingate, N. M., to Prewitt refinery. To start in September.

• **Gulf Refining Co.**—Will build 45 miles of 8-in. from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss. (due on stream May 1957) to a connection with Plantation Pipe Line Co.'s system. No date set to start.

Magnolia Pipe Line Co.—Plans a 30-mile, 8-in. line from Andrews to Dollarhide, Tex., to complete January 1, 1957, and an L.P.G. line, 19 miles of 6-in., 3 miles of 4-in. from Beaumont to Orange, Tex. Brown & Root has under way a 75-mile, 8-in. L.P.G. line from Hull to Texas City, Tex., to complete January 1, 1957.

• **Phillips Chemical Co.**—Panama Williams Corp. has contract to build 76 miles of 6-in. from Pasadena to Sweeny, Tex., for L.P.G., to complete by September 1, 1956. Spread office is in South Houston, and W. H. Shiflett is spread superintendent.

• **Phillips Petroleum Co.**—Plans 15 miles of 6-in. L.P.G. line in Sweeny, Tex., area.

• **Phillips Pipe Line Co.**—Plans 135 miles of 12-in. looping between Borger, Tex., and St. Louis, Mo., to be completed December 31, 1956.

Plantation Pipe Line Co.—Oklahoma Pipe Line Constructors has under way 327 miles of 18-in. from Baton Rouge to Helena, Ala., to complete December 1956. N. L. Arie, spread man, office at Baton Rouge.

• **Shell Oil Co., Pipe Line Department, Pacific Coast.**—Plans to convert 13 miles of existing 4-in. gasoline line, and add 3 miles of new line, to move gasoline from Wilmington refinery to Los Angeles. To be completed January 1, 1957.

• **Sioux Oil Co.**—Plans 80 miles of 4-in. from its Newcastle, Wyo., refinery to Rapid City, S. D., to be completed late 1956.

• **Sohio Petroleum Co.**—Plans 37 miles of 8-in. from Mogadore to Girard, Ohio, to complete November 1, 1956.

• **Southern Pacific Pipe Lines, Inc.**—Plans a 300-mile line to span the Sierras and connect San Francisco with Reno and Fallon, Nev., and to serve the Sacramento Valley.

Sun Pipe Line Co.—Contracts let on 109 miles of 14-in. from Twin Oaks, Pa., to Newark, N. J.; Sheehan Pipe Line Construc-

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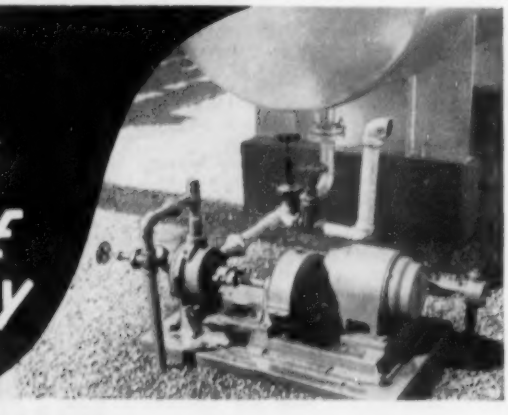

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Pipeline Patrol

tion, 90 miles from Twin Oaks to Plainfield, N. J., J. W. Brown, spreadman, office at Malvern, Pa.; Delaney-Missouri Valley Construction Co., remainder. Missouri Valley Dredging Co. has river crossings at Delaware, Schuykill, and Raritan rivers. Work started May 1, to end September 1956. Line replaces present 8-in. line. Sheehan will take up 75 miles of 8-in. when new line is finished.

Non-Petroleum Pipelines

• **American Gilsonite Co.**—Plans 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.

Natural-Gas Pipelines

American Louisiana Pipe Line Co.—Let bulk of 1,160-mile line from North Tepetate, La., to Detroit. H. C. Price and Houston Contracting Co. have 770 miles of 30-in. from near Willow Run, Mich., to near Eudora, Ark. Majority of work completed.

Houston Contracting Co. started August 1, on 21 miles of 24-in. from Tepetate to Lewisburg, La., R. E. Thornton, supt., office at Eunice. Completed.

Houston Contracting Co. and H. C. Price Co. waiting on pipe to start 121 miles of 22-in. from Payne, Ohio, to Bridgman, Mich. Will start this year if pipe available before winter weather. Houston to lay 75 miles on east end, E. C. Norris, spread man. Price to lay 46 miles on west end.

• **Arkansas Louisiana Gas Co.**—Has long-range plans for line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.

Atlantic Seaboard Corp.—Williams-Austin Co. has under way 50 miles of 24-in. from Hardy County, West Virginia, to Greene County, Virginia, O. L. Martin, spread man, office at Elkton, Va., and 32 miles of 26-in. loops along the Cobb-Rockville line in West Virginia. Ralph Gaddy, spread man, office at Elkins, W. Va., both to be completed November 1, 1956.

• **Carolina Pipeline Co.**—Has received South Carolina Public Service Commission permit to distribute gas in central South Carolina. Plans lines to 14 cities. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.

• **Cities Service Gas Co.**—Plans 12 miles of 30-in. and 17 miles of 20-in. between Oklahoma City and Mulhall, Okla., to be completed October 1, 1956.

Prairie Construction Co., Inc., has 28 miles of 16-in. between Leavenworth, Kans., and St. Joseph, Mo., to complete August 15, 1956. 9 miles of 16-in. near Springfield, Mo., to complete October 1, 1956; 4 miles of 12-in. from Johnson County to Lafayette County, Missouri, to complete September 1, 1956.

• **Coastal Transmission Corp.**—Applied to FPC for 565 miles of 22-26-in. from McAllen, Tex., to Baton Rouge, to deliver to Houston Texas Gas & Oil Co.'s proposed line to Florida. Plans 272 miles of smaller gathering lines.

• **Colonial Natural Gas Corp.**—Proposes two systems: One between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.

• **Colorado Interstate Gas Co.**—R. H. Fulton has 238 miles of 22-in. from Laramie to Green River, Wyo. (last part of a 374-mile line between Denver and Rock Springs), to be completed fall 1956. Filed, March 29, for FPC permit for 1957 program: 307 miles of 30-in. from Idalia, Colo., to Beatrice, Neb., to take gas from a planned 165-mile, 26-in. line from near Carr, Colo., to Idalia, and from a 72-mile, 26-in. line from near

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Kit Carson, Colo. to Idalia; 215 miles of 2[illegible] and 24-in. to parallel present line from Texas Panhandle area to Kit Carson; 34 miles of 16-in. from Keyes field, Oklahoma, and Greenwood field, Kansas, to the new north-south line.

• Has temporary FPC permit to lay 24 miles of 16-in. loop between its Morton County, Kansas, station and Fourway-Kit Carson mainline.

El Paso Natural Gas Co.—Has under way 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix, both to be completed February 1, 1957. Western Pipeline, Inc. has under way 146 miles of 34-in. between San Juan basin and Topock, to be completed February 1, 1957, and 112 miles of 20-in. between San Juan mainline and Phoenix, to be completed November 1, 1956. El Paso also has under way 14 miles of 24-in. from Ignacio, Colo., to the Blanco plant, to be completed October 1, 1956.

Filed June 1956 for FPC permit for **888** miles of field and main lines in **Texas, New Mexico, and Arizona.**

Has FPC permit for 28 miles of 10-in. line in Nolan and Coke counties, **Texas.**

• **Hope Natural Gas Co.**—Plans 22 miles of 8-in. in Logan County, West Virginia, and 20 miles of 3 to 8-in. in various West Virginia counties, to be completed in 1956.

• **Houston Texas Gas & Oil Co.**—Applied to FPC for **960 miles** between Baton Rouge and Miami: 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., 12 miles of 12-in. Plans 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

• **Iron Ranges Natural Gas Co., St. Paul**—Applied to FPC for a 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minnesota.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Has FPC permit for 11 miles of 12-in. from Colby to Oakley, Kans., to be completed August 1956. Plans 10 miles of 10-in. and 10 miles of 8-in. from Grand Island to Albion, Neb., to be completed November 1956.

• **Lone Star Gas Co.**—Has two plans before FPC to enlarge system in Texas and Oklahoma: one is a 230-mile line from Cotton County, Oklahoma, to Fritch, Tex.; one is a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. Plans are attempt to keep Natural Gas Pipeline Co. of America from building line from Wise County, Texas, to Fritch.

Michigan Consolidated Gas Co.—Somerville Construction Co. has under way 67 miles of 10 and 12-in. between Sears and Travers City, Mich., Floyd Huduall, superintendent, office at Cadillac. Somerville, jointly with H. L. Gentry Construction, has under way 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich., Frank Morris, superintendent, office at Hart.

• **Michigan Wisconsin Pipe Line Co.**—Has FPC permit for 252 miles of 24, 18, 12, 6, and 4-in. loops in Wisconsin, to be completed November 1956.

Latex Construction Co., jointly with Houston Construction Co. and H. C. Price Co., has 90 miles of 16 and 20-in. between Milwaukee and Oshkosh, to start June 25 and complete October 1, 1956. John Phipps and U. J. Davenport, spread men, office at Fond du Lac.

H. C. Price Co. and Houston Contracting Co. will build 149.4 miles of loop lines in Wisconsin and Illinois. Price will construct 56 miles of 24-in., and Houston will build 42.4 miles of 20-in. and 51 miles of 16-in. (being

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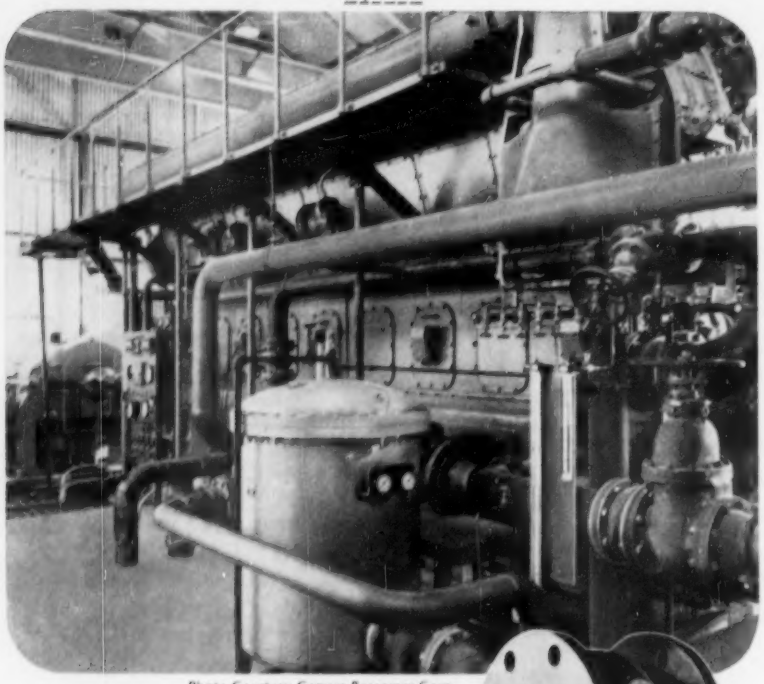

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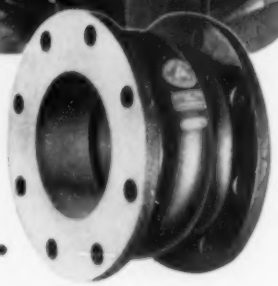

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• **Midwestern Gas Transmission Co.**—Will build a main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in. Plans 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin, pending FPC approval.

Montana-Dakota Utilities Co.—Awarded contract to Ross Powers Construction Co., Billings, Mont., to start in August 1956, on 28 miles of 12-in. from Fallon County to Dawson County, Montana.

Montana Power Co.—O'Conner Construction Co., Fromberg, Mont., has contract for 75 miles of 6-in. from Big Coulee field to Lewistown and Harlowton, Mont. Starts September 1.

Mountain Fuel Supply Co., Salt Lake City.—Has temporary FPC permit to build 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

• **Natural Gas Pipeline Co. of America.**—Has FPC approval for 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., which will be contested by Natural Gas Pipeline and Lone Star Gas Co. Filed for FPC permit for a 389-mile, 36-in. loop along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co. Also for 91 miles of 30-in. looping to be laid along parts of its main line.

New York State Natural Gas Corp.—Williams-Austin Co. has 17 miles of 30-in. from Caton to Horseheads, Steuben County, New York, starting August 1, to complete November 1, 1956.

Niagara Mohawk Power Corp.—Let to various contractors, 275 miles of 2 to 12-in. distribution mains for growth of service areas in Central, Eastern, and Northern New York, to be completed December 31, 1956.

• **North Carolina Natural Gas Corp.**—This subsidiary of Colonial Natural Gas Corp. has permit from North Carolina Utilities Commission for 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across North Carolina.

• **Northern Natural Gas Co.**—Applied to FPC to add 348 miles of main line, 307 miles of branch lines in Wisconsin, Minnesota, South Dakota, and Iowa. Main lines include 169 miles in Duluth-Superior area, 164 miles in Aberdeen area of South Dakota.

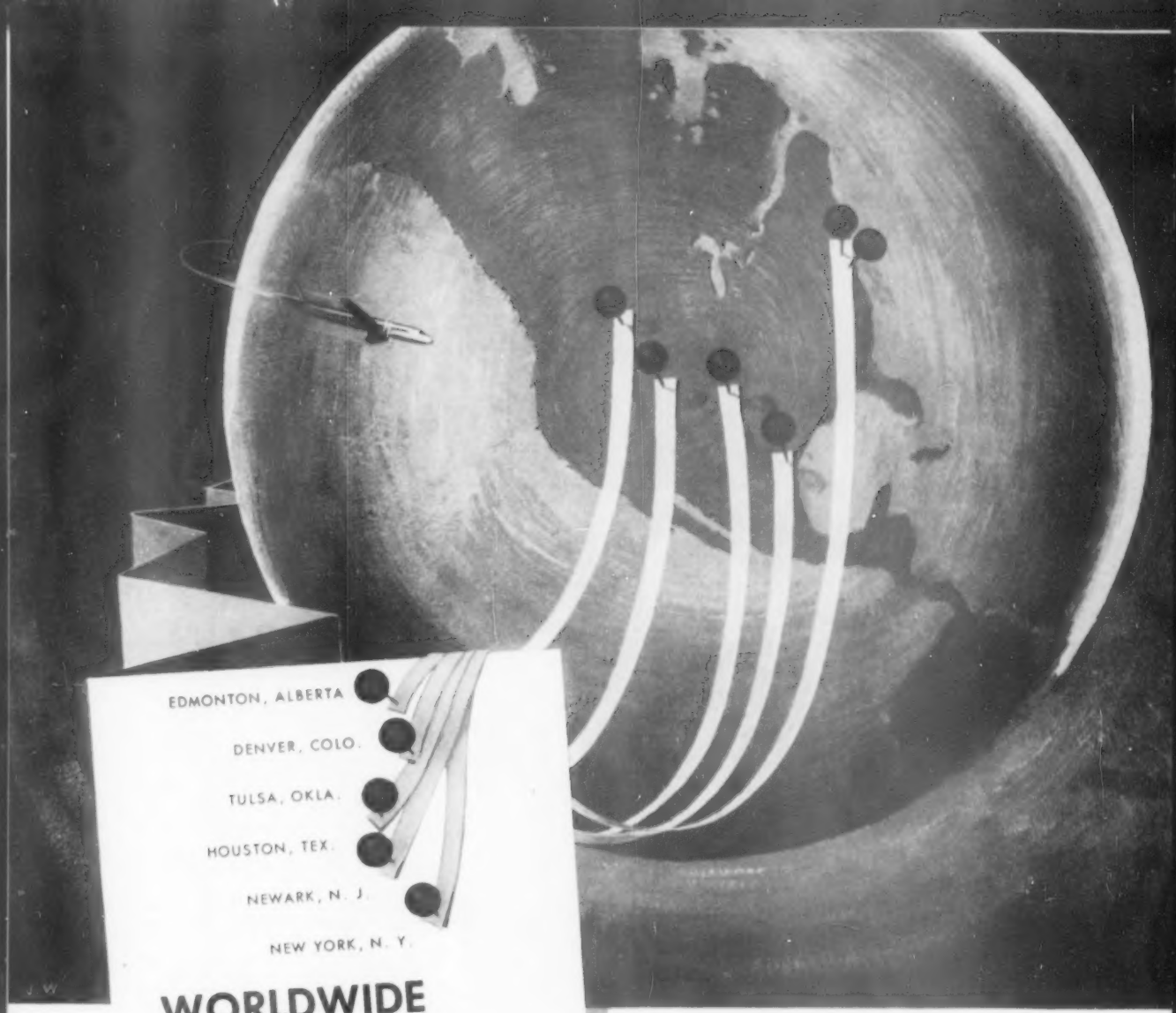
Pentzien, Inc., has 24-in. Elkhorn River crossing.

Plans 73 miles of 20-in., Savanna Creek to Pincher Creek fields in Alta., Canada. 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

• **Offshore Gathering Corp., Houston.**—Seeks FPC permit for 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in.; 70 miles of 26-in.; 234 miles of 30-in.

• **Pacific Gas & Electric Co.**—Will build 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento. Has under way a 6-mile gathering system at Beehive Bend. Also plans to loop the Topock-Milpitas line with 135 miles of 34-in., laying major part in 1956, and 62 miles in 1957. A joint-venture firm, Midwestern-Johnson-Dixon, has 85 miles of this to complete in 1956.

• **Pacific Northwest Pipeline Corp.**—Has FPC permit for 37 miles of 6-in. from Dove Creek, Colo., to Nucla, and 13 miles of 4-in. from Nucla to Uravan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of



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Pipeline contractors have found that Crose equipment on the line means more efficient construction. Crose maintains strategic supply points and uses fastest transportation methods for best delivery and service to the pipeline industry everywhere.

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ROAD BORING MACHINES

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Pipeline Patrol

America. Work under way on other trunk and sales laterals:

R. H. Fulton & Co., 156 miles 20 and 16-in. lateral from main line to Spokane; also 129 miles of laterals into Idaho, to complete fall 1956.

• **Permian Basin Pipeline Co.**—R. H. Fulton & Co. has 19 miles of 16-in. in Andrews County, Texas.

• **Phillips Chemical Co.**—Plans 79 miles of 6-4-in. ethylene line from Sweeny to Pasadena, Tex., to be completed December 31, 1956.

• **Piedmont Gas Co., Hickory, N. C.**—(Parent is Carolina Natural Gas Corp.) Seeks FPC permit for 78 miles of 2 to 8-in. extension off Transcontinental in North Carolina, to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Portland Gas & Coke Co.—United Engineers & Constructors, Inc., of Philadelphia, has engineering contract for 80 miles of various size lines up to 16-in.

Reynolds Sales Co.—Collins Construction Co. has 20 miles of 10-in. in Corpus Christi Bay and Oso Bay, F. T. Glascock, project manager, Fred Wakefield, general supt., office at Gregory, Tex.

Signal Oil & Gas Co.—C. P. Bartley & Son has 70 miles of 2 to 16-in. gathering system near Tioga, N. D., to be completed September 1, 1956. C. P. Bartley, Jr., and Lawrence Barto, spread men, office at Tioga.

Southern California Gas Co. and Southern Counties Gas Co. of California.—R. H. Fulton & Co. has contract to lay 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border. Right-of-way and ditch starts in October, pipe in January. Line to be completed in June 1957.

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Engine breakdowns can be troublesome—troublesome in costly production delays and major repairs on your expensive engines. But this won't happen with Penn on the job. In case of low lubricating oil pressure or overheated cooling water, the Penn engine safety control steps in. An alarm sounds, a light signals or the engine shuts down—whichever you prefer. Then you can discover and correct the condition before damage can develop. Ask your engine supplier for Penn Safety Controls.

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Also building 49 miles of 30-in. from Newhall to Alhambra, Calif. Work is under way by: Alex Robertson Co., 13 miles; Macco Corp., 16 miles; Joe E. Young Contractors, Inc., 19 miles. To be completed December 1, 1956.

• **Southern Natural Gas Co.**—Has temporary FPC authority for 39 miles of loops near Atlanta, Ga.

• **Tennessee Gas Transmission Co.**—1—Bechtel Corp. has 74 miles of 30-in. looping from Glasgow to Danville, Ky., to complete by October 1, 1956, Joe L. Work, spread man, office at Greensburg, Ky.

2—142 miles of 26-in. looping in Ohio, to be completed fall 1956, under contract to: H. C. Price, 81 miles from near New Boston to near McConnelsville, G. A. Reutzel, spread man, office at Chauncey (30 miles completed); Oklahoma Construction Co., 61 miles from near Newcomerstown to near Lisbon, office at Carrollton, Gene Gohring, spread man.

3—Has FPC permit for 63 miles of 30-in. looping from Scottsville, Ky., to Cave City, and from southwest of Danville to northeast of Danville.

4—Has FPC permit for 99 miles of 26-in. looping from Greenup, Ky., to north of Ohio River, from McConnelsville to Newcomerstown, and from Lisbon, Ohio, to near Mercer, Pa.

5—Houston Contracting Co. has 30 miles of 8 and 12-in. near Golden Meadow and Leeville, La. H. E. Murphy, superintendent. Pipe starts immediately.

• **Texas Eastern Transmission Co.**—Applied to FPC, December 1955, for 422-miles of 30-in. from McAllen to Beaumont, Tex., to move imported Mexican gas. Applied for 530 miles of 30-in. looping from Kosciusko, Miss., to Uniontown, Pa. Will lay 45 miles of 24-in. from Provident City, Tex., to connect in Matagorda County, Texas, to tie the Wilcox Trend Gathering System with the extension from Mexico.

Texas Gas Transmission Corp.—Houston Contracting Co. has 195 miles of work in Miss., Ark., and Southern La.: 22 miles of 30-in. and 10 miles of 18-in. reconditioning near Clarksdale, Miss., started August 1, W. H. Hayes, supt.; 31 miles of 30-in. and 10 miles of 18-in. reconditioning near Greenville, Miss., and Wilmot, Ark., started August 5, F. A. Silar, supt.; 122 miles of 20-in. to lay from Eunice, La., to East of Morgan City, La.; M. L. Thompson, supt.

• **Trans Carolina Pipe Line Corp.**, Commercial Building, Raleigh, N. Car.—Seeks FPC permit for 300-mile system across North and South Carolina, plus 500 miles of laterals.

• **Transcontinental Gas Pipe Line Corp.**—Has applied to FPC to lay 160 miles of 36-in., 67 miles of 30-in., and 24 miles of 24-in. loops from Louisiana to Pennsylvania, to be completed December 1, 1956; 25 miles of 36-in. loops from Louisiana to South Carolina, to lay in 1957. Has also applied for 31 miles of 36-in. and 43 miles of 30-in. line to be built during 1957.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.—Firm is building a 140-mile, 20-in. line from Safaniya field to Ras Tanura.

B-A Alberta Pipe Line, Ltd.—Seeks approval for 35 miles of 8-in. to connect Drumhell field, Alberta, with existing Gulf lines running to Edmonton.

Interprovincial Pipe Line Co.—Has applied to Board of Transport Commissioners for 151 miles of 20-in., an extension of its line from Sarnia to Port Credit, Ont. If approved, work will start spring 1957, end that fall.

• **Mene Grande Oil Co.**—Plans 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion Lateral, Venezuela, to complete first quarter 1957;

Pipeline Patrol

24 miles of 12, 14, 16-in. from Oficina Tank Farm to Oveja, to complete in 1956.

Pembina Pipe Line, Ltd.—Sparling Davis Co., Ltd., has 100 miles of 3 to 10-in. gathering system in Pembina field.

PEMEX.—Constructora El Aguila, S. A. has 50 miles of 20-in. from Angostura to Veracruz, Antonio Sanz Polo, spread man, office at Veracruz.

• **Royal Dutch-Shell**—Together with several other companies, is considering 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, the Netherlands, and Belgium. Main trunk would be 30-in.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**—Will build 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

Union of Soviet Socialist Republic.—Has under way a 2,300-mile Trans-Siberian crude and products system from Ufa and the Tumaza fields in Bashkiria to Irkutsk near Lake Baikal.

Yacimientos Petroliferos Fiscales (Argentina).—Has started 700 miles of 12-in. from Campo Duran to San Lorenzo. TECHINT (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 160 miles of 10-in. and 43 miles of 8-in. from Sicasica to Arica on the Chilean coast, to be completed December 1957.

Foreign Products Pipelines

• **Estrada de Ferro Santos a Jundial Departamento Oleoducto.**—Plans 6 miles of 14-in. from the Capuava Refinery to Utinga Terminal, to be completed December 1956.

Hydrocarbons Pipeline Co. (subsidiary of Canadian Hydrocarbons)—Has permit from Parliament of Canada to build 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Ft. William, Ont. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957. Williams Brothers, Calgary, and A. D. Little and Co., Boston will act as construction consultants.

• **Imperial Oil, Ltd.**—Will lay 38 miles of 12-in. loop along present line from Waterdown, Ont., to Toronto.

• **Iraq Petroleum Co., Ltd.**—Plans 75 miles of 24-in., 180,000-bbl. daily capacity, from Homs, Syria, to Tripoli, Lebanon.

• **Israeli Government.**—Will build 6-in. products line from Haifa to Tel Aviv.

National Iranian Oil Co.—Contracts let on 573 miles of 10-in., 40,000-bbl. daily capacity from Ahwaz to Teheran, Iran; Enterprise of Paris, has northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—Laying 2,000 miles of lines to airfields in parts of Europe. Associated Pipeline Contractors, Inc., has 450 miles from Iskenderun, Turkey, to Batman. TECHINT (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956, on 300 miles of 12-in. between Marseilie and Langres, France.

PEMEX.—Constructora El Aguila, S. A., has 155 miles of 12-in. from Tampico to Cd. Victoria, Geronimo Aviuchastegui, spread man, office at Tampico.

The United States Defense Department.—Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain. Contracts let to Merritt Chapman & Scott; Benson & Montin of Oklahoma City; Agroman Construction Co. of Spain. Prime contractor is Brown Raymond-Walsh.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 190 miles of 4-in. from Camiri to Santa Cruz to be completed December 1956.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co.**—Plans 54 miles of gathering system for the Trans Canada line. About 40 miles of 34-in. will be laid in 1956 to connect Bindloss field. Remainder to be laid in 1957 and 1958. Fields to be connected are Pincher Junction, Provost Sibbald, Oyen, Sunnynook, Steveville, Cessford, Countess, Dutchess, Princess, Homeglenn, Rimbey, Nevis.

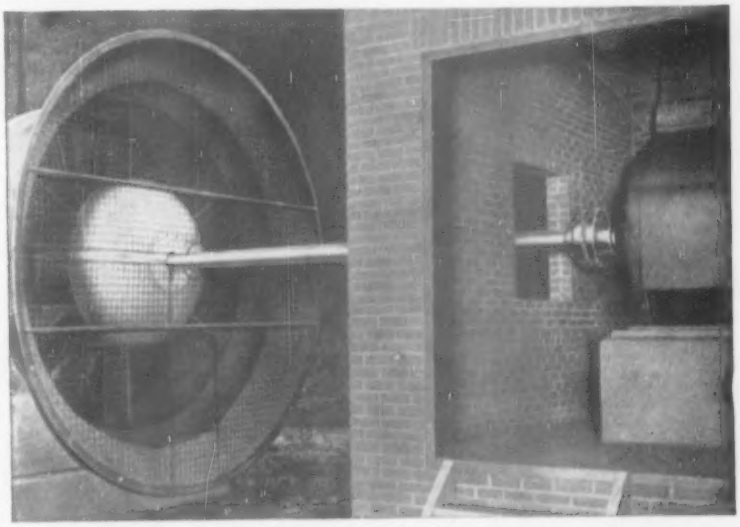
Andes Pipeline Corp.—This subsidiary of Glenn McCarthy, Inc., will build and operate 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper mining area.

Attock Oil Co.—Plans 60 miles from Dhulian field to Rawalpindi in West Pakistan.

Cia. Shell de Venezuela.—Plans 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces. To be completed in 1957.

• **Trans-Canada Pipe Lines, Ltd.**—Work begins July 1, 1956, on 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. Contracts let on first four sections to: Majestic Contractors, Ltd.; Canadian Bechtel, Ltd.; Mannix Ltd.; Dutton-Williams Brothers, Ltd. Three sections still to be let. Completion of this stretch planned for December 1, 1956. This is the first stretch of a 2,250-mile line from Alberta to Toronto and Montreal. Deadline for exporting gas from Alberta is December 31, 1957. Tennessee Gas Transmission Co. has proposed a line to take the gas at Emerson, Man. (See Midwestern Gas Transmission Co.).

Eliminate Intermediate Bearings!



By using Thomas Flexible Couplings on long, unsupported shafts, intermediate bearings are eliminated. Thomas engineers tubular shafts free from lateral whip.

The large fan shown above is 16′ from the motor to allow sufficient air intake. Miners working underground receive their fresh air supply from this fan and others like it, which have been giving dependable service for as long as fifteen years . . . without shutdowns for lubrication or maintenance of the couplings.

Thomas floating shaft flexible couplings are recommended for machine and marine drives, printing presses, paper and cement mills, cooling towers, diesel engines, pumps, compressors, and many other uses.

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UNDER LOAD and MISALIGNMENT

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4. Visual Inspection in Operation
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THOMAS ALL METAL COUPLINGS HAVE NO WEARING PARTS SO LUBRICATION AND MAINTENANCE ARE ELIMINATED

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

Name of Customer _____

Supply Company _____

Point of Sale _____

GOODALL RUBBER COMPANY
Incorporated

Certificate **No. 2726**

UNDER Contract Number _____

ROTARY HOSE SERVICE CERTIFICATE

THIS IS TO CERTIFY that the undersigned Supply Company has this day sold and delivered to the Customer named above one Goodall Rubber Company Rotary Hose described as follows:

Serial Number *Size* *Length* *Goodall Specification Number*

and this certificate is issued specifically for the purpose of bringing the said hose within the provisions of the above numbered contract to the above named Customer, and this certificate shall be valid and effective when executed by an officer of said Goodall Rubber Company.

The Goodall Rubber Company hereby unconditionally guarantees Goodall Rubber Co. Rotary Hose against failure due to any defect in workmanship and/or material for the period of one year from date of purchase. If at any time during the 12-month period from date of purchase, such Rotary Drilling Hose as identified by the Service Certificate should meet with accident under normal operating conditions, the Goodall Rubber Company agrees to:

A. Repair such hose without charge to the customer, other than transportation charges to and from the plant designated by the Company, provided in the opinion of the Company it can be made suitable for further use as Rotary Drilling Hose.

B. Convert any such Rotary Hose damaged by accident to such an extent that it cannot reasonably be made useable thereafter as Rotary Hose into as many vibrator hoses as possible, free of charge to the customer except for necessary additional couplings and freight to and from the specified plant.

WITNESS our signature at _____ on the _____ day of _____, 195____.

Accepted and Validated:
GOODALL RUBBER COMPANY

By _____
Title

_____
SUPPLY COMPANY

By _____
Title

Only Goodall offers this guarantee

The Goodall Guarantee shown above is one example of the Goodall way of showing their appreciation to the Drilling Industry. Goodall's success is due to the acceptance of their rotary hose by users all over the world. In order to keep their position at the top Goodall will continue to offer the finest product of its kind made—the Goodall Rotary Hose with the Barney Coupling—at competitive prices.

Goodall stays at the top because they have always pioneered a better product. Some examples are: the first high pressure rotary hose—the Barney Coupling—the Goodall repair service—the built-in safety clamp.

GOODALL RUBBER COMPANY

TRENTON, N. J.

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The OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

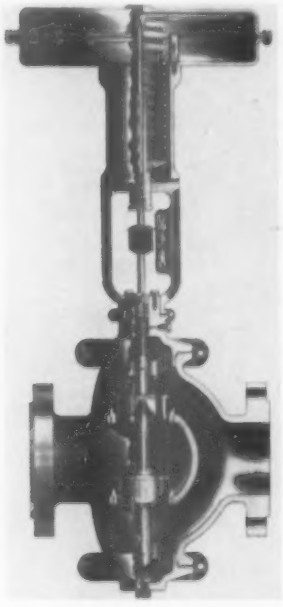
by Dan B. Miller

Diaphragm Control Valves Offer 3 Styles, 4 Sizes

Called the Super 70 series, a line of diaphragm control valves include a new topworks, redesigned valve body, and an all-metal float-ring seal.

The topworks features a new molded diaphragm for uniform thrust over full valve travel, pressed-steel cases for maximum strength with minimum weight, and a precision-calibrated single spring. The entire topworks is iridited and cadmium plated for corrosion resistance. Topworks is available in direct or reverse-acting styles and in four sizes.

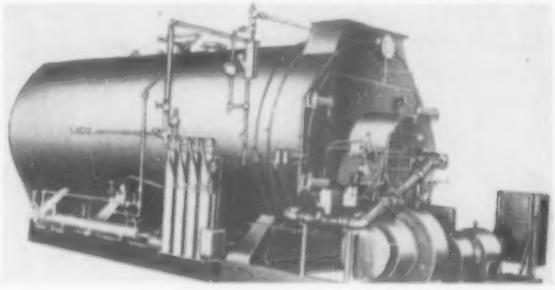
The valve bodies have a new streamlined-flow contour for greater stability, new top and bottom-guided inner valves for more exacting flow characteristics, and a new all-metal float-ring seal which provides self-actuating closure and tightens with application of pressure. A new forged-clamp ring allows yoke orientation to any position. The valve bodies include a bolted stuffing box with stainless-steel followers.



Valve bodies are available in three styles; single port, double port, and split body.

For more information write or call: Black, Sivalls & Bryson, Inc., 7500 East Twelfth Street, Kansas City 26, Mo.

750 Hp. Generator Delivers 26,000 Lb.



A 750 hp. package steam generator delivers 26,000 lb. of steam per hour at over 80 per cent efficiency. Because of the cyclonic-combustion principle, it is no larger than most 500 hp. package generators. Over-all dimensions are: 28 ft. by 9 ft. 6 in. by 10 ft. 8 in.

Designed for heavy oil or gas, the boiler can be adapted to burn either L.P.G. or light oil. The Cyclotherm C-26,000 makes it possible to utilize package boilers for many industrial-processing loads formerly considered too big for a single-package boiler and makes multiple installation of these units competitive with all but the largest industrial-boiler installations.

For more information write or call: Cyclotherm Division, National-U. S. Radiator Corp., Oswego, N. Y.

The OIL AND GAS JOURNAL *Showcase Coupon*

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BETTER OFFSHORE WITH SIKORSKY

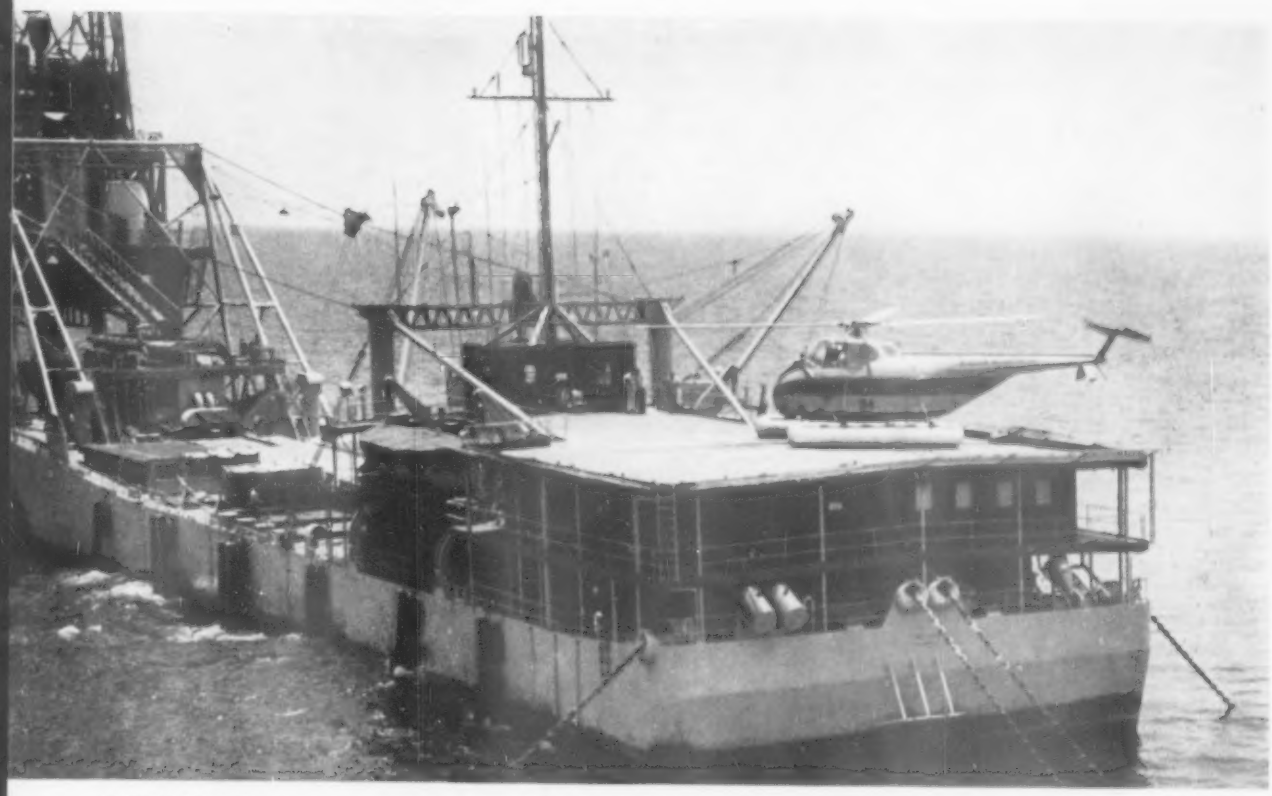
Dependable, fast-flying Sikorsky transport helicopters are today helping oil companies do a faster, better job offshore in the Gulf of Mexico—earning their way here as they have in so many parts of the world where surface transportation is a problem.

This year in the Gulf of Mexico area helicopters are carrying about 20,000 crewmen and specialists each month. The stamina and many safety features of Sikorsky helicopters demonstrated in offshore service reflect the success of these helicopters operating under difficult conditions in jungles, deserts, mountainous terrain, and at sea. Amphibious flotation gear is standard for offshore flights. Provision for a power hoist and cargo sling offers extra versatility.

Sikorsky helicopters—the familiar S-55 and its new companion, the even larger S-58—are based on more than 15 years of engineering, manufacturing, and operational experience.

CARRYING CREWMEN for routine trips, specialists and cargo for rush needs, Sikorsky helicopters are hard at work every day with forward-looking oil companies. Frequent scheduled flights serve many offshore rigs. The 85-mph cruising speed of the Sikorsky S-55 provides quick and easy flights to rigs far offshore. Crewmen appreciate helicopter travel, which replaces long, uncomfortable trips by surface transportation.

OPERATIONS HELICOPTERS



VERSATILE Sikorsky helicopters land offshore on tenders or on platforms directly on the rigs. In either oil company or charter operation, the big, fast helicopters pay off in many ways—cutting investment in surface transportation, slicing offshore costs by saving hour after hour of valuable time.

NEW LARGER SIKORSKY S-58 is now being ordered for offshore duties. The S-58 can carry 12 passengers 150 miles offshore and return without refueling. Maximum speed is 125 mph, cruising speed 100 mph. The new S-58—carrying more people farther and faster than any helicopter previously available—opens up profitable new offshore possibilities.

For more information on Sikorsky helicopters, telephone or write B. L. Whelan, general manager, Sikorsky Aircraft.

SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

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OIL AND GAS JOURNAL *Showcase* OF NEW EQUIPMENT

Relief Valve Offers Two Ratings with Eight Settings

This safety-relief valve is actuated by fluid pressure against the valve piston which shears a common wire nail when the pressure exceeds the setting. This allows the stem and piston to travel instantly through the valve body and rest against the cushion, completely out of the way of the fluid flow.

In addition to providing protection for equipment, the valve also offers safety for personnel. The valve is equipped with a cover that remains closed, by means of the latch spring under the end of the shear bar, until the nail shears and the valve opens. When the nail shears, the shear bar moves up which releases the latch spring on the cover. The cover spring at the back then causes the cover to open but without force.

The valve seat and stem are hard-chrome plated to prevent freezing caused by rust and corrosion and to prolong the life of the piston and cushion. Both the piston and cushion form a fluid-tight seal so the valve cannot leak, even under back pressure.

Important features include: fast opening to prevent erosion of piston and bore, only one size nail is required for eight different pressure settings, setting plate provides complete pressure-setting information.

Two pressure ratings are offered; a low pressure with settings of 300, 400, 500, 600, 700, 800, 900, and 1,000 lb., and a high pressure with settings of 1,000, 1,250, 1,500, 1,750, 2,000, 2,250, 2,500, and 2,750 lb. Both valves have 2-in. threaded connections and have cast-steel bodies.

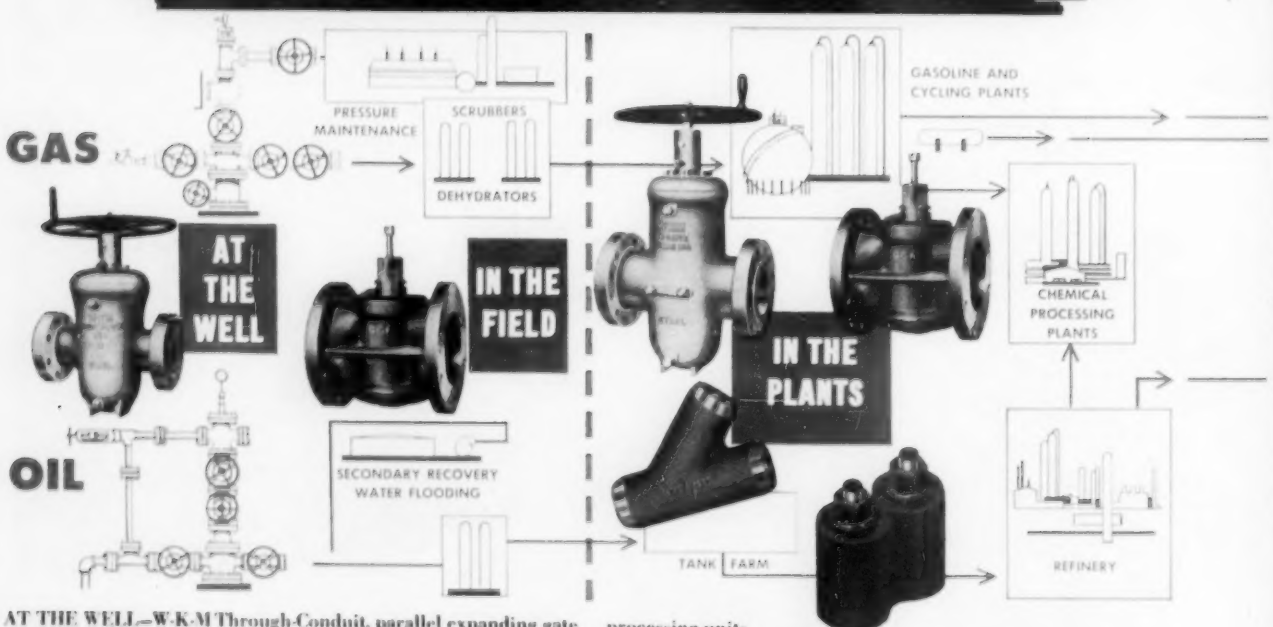
For more information write or call: Drilling Equipment Mfg. Co., 833 S.E. Twenty-ninth Street, Oklahoma City, Okla.

•

Drum Rack Shipped or Stored With Drum

This new drum rack provides an easy, efficient way to handle heavy drums or barrels. The entire assembly can be attached to the barrel or drum in 5 minutes. With device in place, the drum with rack attached can be

W-K-M PRODUCTS
WORK FOR THE WHOLE INDUSTRY



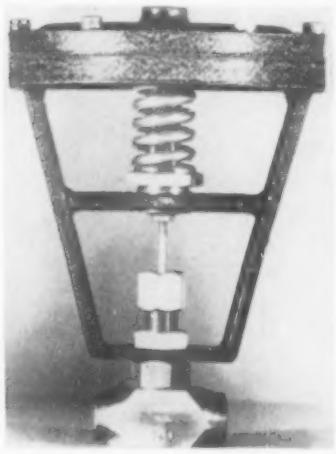
AT THE WELL—W-K-M Through-Conduit, parallel expanding gate valves on christmas trees, flow wings, high pressure flow lines, etc.

IN THE FIELD—OCF Rectangular and Round Port lubricated plug valves on manifolds, headers and flow lines serving field processing units.

IN THE PLANT—W-K-M valves on feed lines to gasoline and cycling plants, refineries, chemical, petro-chemical and processing plants.

shipped or stored, requiring no additional space. Drum can be placed anywhere for convenient use. It requires only 10 seconds to set up. **For more information write or call: Dale Co., 1237 West Fifteenth Street, Los Angeles 13, Calif.**

●



Micro-Control Valve Is Air Operated at 10 to 800 Psi.

Ideal for use in laboratories, pilot plants, and industrial-processing plants, this new line of low-hysteresis micro-control valves was developed for one of the major oil companies. The valves have been extensively used in laboratories and pilot-plant development works for the past 3 years.

Special features include low initial cost, simple construction which enables easy assembly, repair or size change using simple hand tools, and a wide range of control pressures from a minimum of 6 cu. ft. of air at 10 psi. to a maximum of 800 psi. The valves are air operated and can be used with any standard air-control instrument.

Available in three sizes, they have a standard body material of 304 stainless steel with Chevron-ring Teflon packing. Only the stainless steel and the Teflon come in contact with the flowing fluid. The valve may be fabricated from other material.

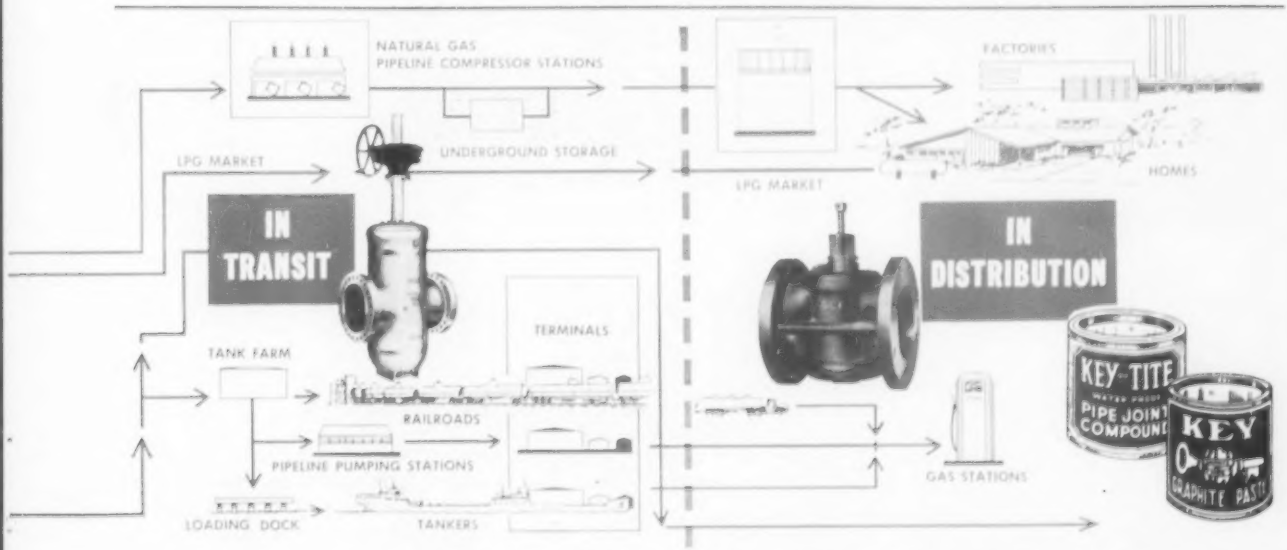
For more information write or call: Modern Manufacturing Co., Box 367, Bartlesville, Okla.

●

New Air-Cooled, 4-Cylinder Engine Delivers 70 Hp.

A new valve-in-head, air-cooled, four-cylinder vee-type engine delivers 70 hp. at 3,000 r.p.m. Designated as the model CV4-180, the engine features interchangeability of major component parts with its counterpart, the C2-90 model 30 hp. engine, such as the aluminum cylinder head, cylinder barrels, pistons, connecting rods, bearing, and valves. A full pressure lubricating system is employed.

A four-throw, three-main-bearing dynamically counterbalanced crankshaft and twin three-bearing camshafts are included in the engine design. All



QCf valves on the service lines in these plants, handle a wide range of commodities.

KEY Return Bends in furnaces and heaters. KEY-KAST Welding Fittings throughout the entire piping system where tees, wyes, ells, laterals, and other shapes are required.

IN TRANSIT—W-K-M pipeline valves all along the lines; in compressor and pumping stations; on loading docks, tank farms and terminal storage.

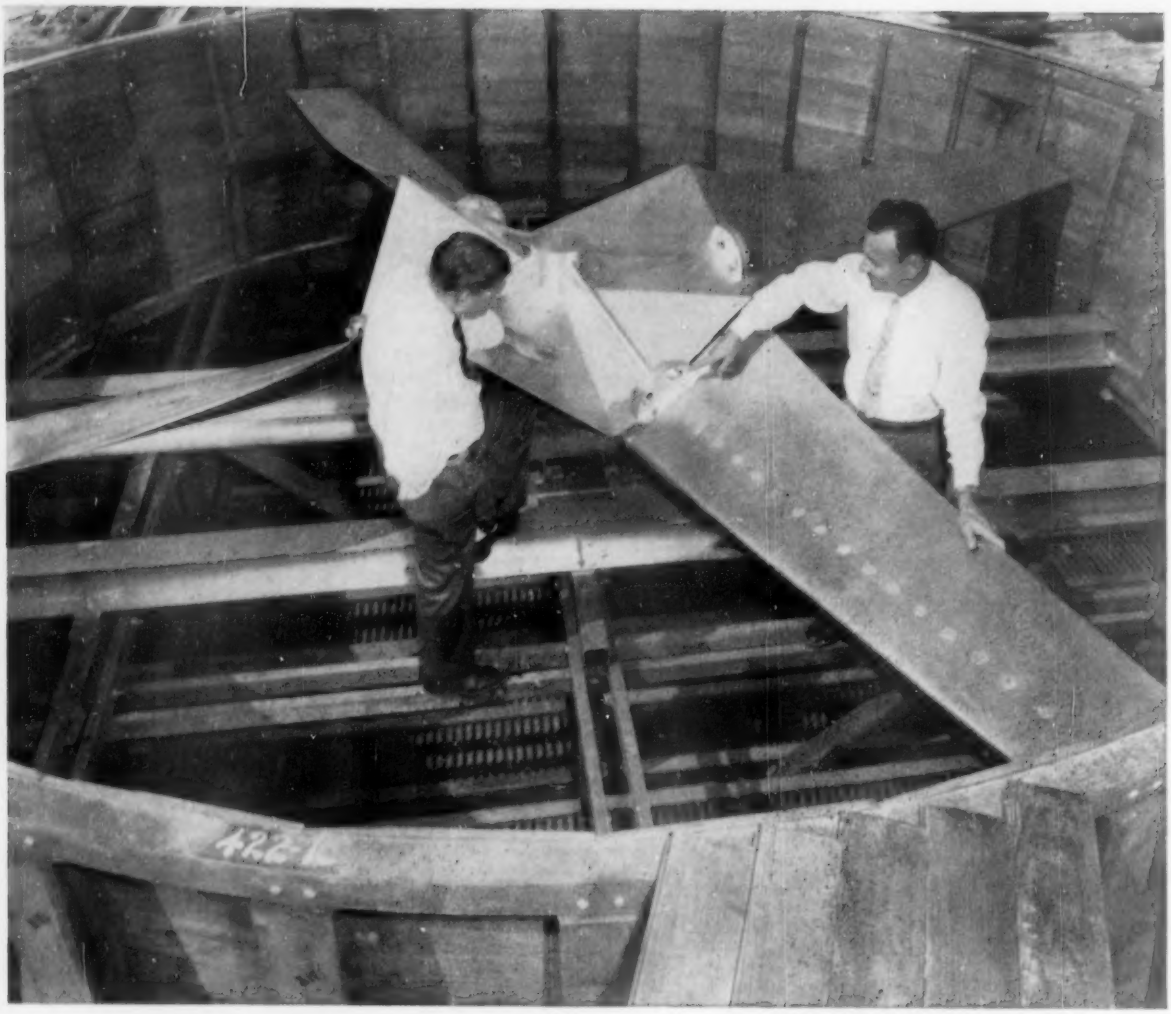
IN DISTRIBUTION—QCf valves in gas storage and distribution systems for homes and industry.

KEY-TITE and KEY GRAPHITE PASTE for sealing threads and gaskets on lines handling water, steam, natural and artificial gas, oil, acid and refined petroleum products.

W-K-M MANUFACTURING COMPANY, INC.
A SUBSIDIARY OF QCf INDUSTRIES INCORPORATED
PLANT: MISSOURI CITY, TEXAS • MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

MANUFACTURERS OF

W-K-M	QCf	KEY
THROUGH-CONDUIT GATE VALVES	LUBRICATED PLUG VALVES	RETURN BENDS AND FITTINGS



"Here's another exclusive feature on Pritchard Towers, Joe!"

"You mean the twist on the fan blade?"

"Yes. It's part of the patented design of Pritchard's fan. Incidentally, this fan was designed specifically for cooling tower service. Also notice the use of monel metal in the blades."

"Just what is different about its design that makes the Pritchard tower more efficient?"

"Each blade is pitched in such a way as to pump as much air at the hub as at the tip of the fan blade. Even the hub design is unique."

"Now, I understand. In other words the hub and blade design permits back-flow near the hub and increases efficiency."

"Right. This means the fan operates on less horsepower—a big savings to you."

"I sure like the way the blades are fastened to the hub."

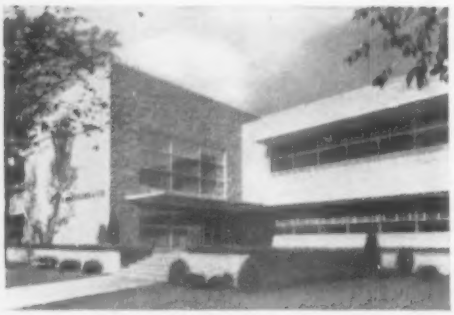
"That's another interesting feature, Joe. It's a real simple and rugged connection that enables us to change the pitch of the blades quickly and easily."

"Those Pritchard designers and engineers think of everything! That's why I always think of Pritchard, first!"

J. F. PRITCHARD & CO. OF CALIFORNIA
4625 Roanoke Parkway, Kansas City 12, Mo.

"Here's another exclusive feature on Pritchard Towers, Joe!"

Complete staff of Pritchard engineers are available to you!



Pritchard maintains a staff of trained, experienced engineers in Kansas City to handle your individual problems whenever you invest in a Pritchard Cooling Tower.

These engineers are readily available to you. They can provide you with a complete inspection service and counsel whenever you desire.

Pritchard also has, of course, a permanent full-time staff of field superintendents, all of whom have many years of continuous service in erecting cooling towers. Here is solid assurance of fast erection, quality workmanship and a minimum of interruption to your plant operation.

Pritchard Cooling Towers are built to meet or exceed the new Cooling Tower Institute standards!

WRITE FOR PRITCHARD COOLING TOWER BROCHURE

"ANSWERS TO THE 15 QUESTIONS ABOUT PRITCHARD INDUCED DRAFT COOLING TOWERS" includes tips on evaluating cooling tower bids, and other factors to consider when choosing a tower. Write for your complimentary copy today on your company letterhead!

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J. F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO
Dept. 542, 4625 Roanoke Parkway
Kansas City 12, Mo.

COOLING TOWERS * GAS & AIR TREATING EQUIPMENT
REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

engine accessories are flange mounted and gear driven from the timing-gear train housing.

The CV4-180 weighs approximately 463 lb. less electric starter, generator, and flywheel housing which are being offered as optional equipment. The engine-power end will be offered with S. A. E. No. 3, 4, and 5 bell housings as with special pump adaptors and shaft extensions to suit customer requirements.

For more information write or call: Lycoming Division, Avco Mfg. Corp., 550 South Main Street, Stratford, Conn.

●

Transparent Vinyl Tubing Handles Corrosive Liquids

For laboratory and plant application, this plastic tubing will handle a wide variety of chemicals and reagents and has excellent flexibility and nontoxicity.

Available in both transparent vinyl and translucent polyethylene forms, it may be steam-sterilized and is particularly suited for general laboratory usage and similar applications. The tubing is available in sizes from ⅛-in. i.d. by ¼-in. o.d. to 1-in. i.d. by 1¼-in. o.d., with 11 standard sizes offered. **For more information write or call: American Agile Corp., P. O. Box 168, Bedford, Ohio.**

●

New Spider-Elevator Tool Safety-Rated at 500 Tons

Designed for operation as either a spider or elevator, this new tool offers a safety-rated capacity of 500 tons. This new BJ spider-elevator is of the slip type and eliminates the need for separate pieces of equipment. It features unitized slips which may be manually or power operated.

This combination spider-elevator is a totally new design, in concept, exterior appearance, slip construction, and oper-

OIL and GAS JOURNAL **Showcase** OF NEW EQUIPMENT

ation. With the trend toward deeper holes and heavier casing programs, the need for such a tool specifically designed and rated to handle both functions has been established.

For more information write or call: Byron Jackson Tools, Inc., Los Angeles 54, Calif.

●

Spectrometer System Assays, Analyzes, and Records

A stepwise-scanning spectrometer system, designated the RLP-6, is an automatic-stepping, single-channel, pulse-height analyzer. It is designed to assay radioactive samples quantitatively and perform isotopic separation by the analysis of nuclear-radiation spectra.

The RLP-6 consists of a radiation-spectrometry detector, the analyzer proper, housed in a blower-cooled 5-ft. rack, and a data printer. The system obtains and automatically records data normally required for analysis of nu-

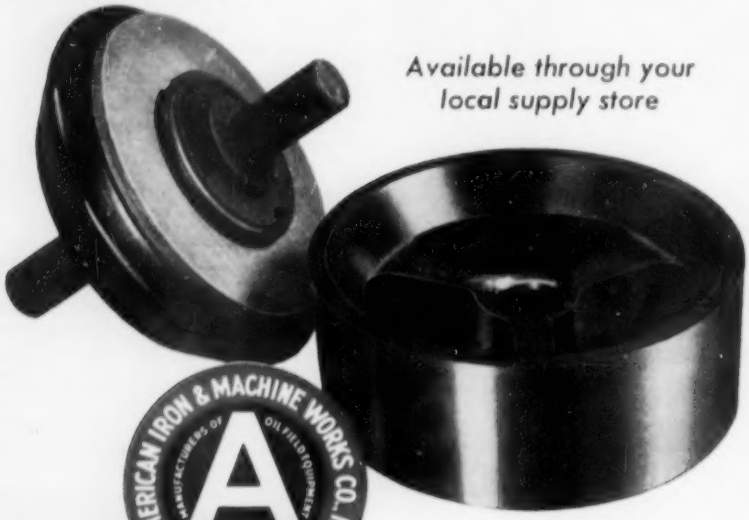
clear-radiation spectra, in the same manner as a human technician would obtain and record such data. It may be operated for long periods of time; over-

The Valve & Seat for men who want the BEST...

More slush pumps use . . . more contractors depend on American Iron Valves & Seats—than any other valves and seats on the market.

Designed by engineers who *know* slush pumps, these valves and seats incorporate all modern ideas on fluid flow, volumes and pressures. Three-web seat . . . round lip insert . . . equal distribution of pressure on insert . . . all are products of modern scientific design—and all are a part of American Iron Valves & Seats.

Modern machine technology and skilled hands transform the design into the actual product of steel and rubber. Seating surfaces are ground to a micro-finish and exposed parts treated to inhibit rust and corrosion. All this—plus the most advanced rubber-compound insert which lasts longer even in corrosive oils —is the final product for men who want the *best* valves and seats in their pumps.



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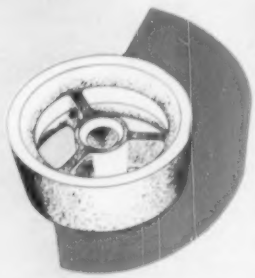
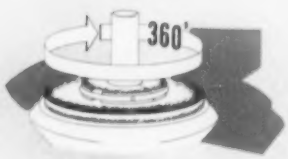
Another AMF Product — PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

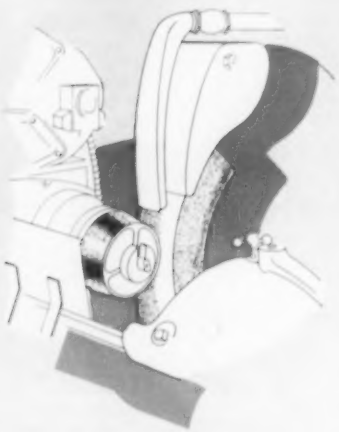
Packaged for easy storage in the supply house . . . and protection against rough treatment and weather in the tool house.



Three-web design of American Iron Valve Seats enables seats to absorb terrific pounding of modern high pressure pumps while providing maximum fluid passage.



Split-ring retainer is standard equipment. This retainer gives 360° support to insert, preventing chipping or cracking of rubber compound.



American Iron Seats are precision ground for perfect seal in pump port. No other production method gives the perfect sealing surface as this automatic honing machine.

Compound 808 Insert, the finest available in composition and design, has high resistance to low aniline point oils. The rounded lip assures smoother running pumps and higher pump efficiency.

Each American Iron Valve is treated with Lubrite. This chemical treatment guarantees rustless valves even in damp weather and over prolonged storage.

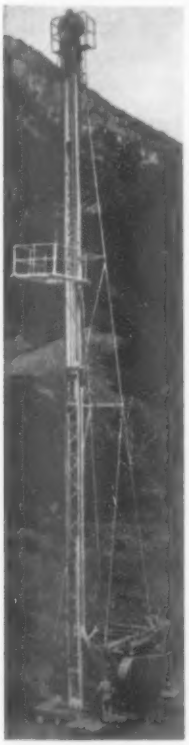
night, over holidays, or week-ends; without operator attendance.

All data required for the analysis are printed. Both time and count information are automatically recorded, so that no data are lost.

For more information write or call: Tracerlab, Inc., 130 High Street, Boston, Mass.

●

85-Ft. Service Derrick Holds 60,000 Lb. of Tubing



Designed especially to afford added height for rod and tube servicing without sacrificing portability, this new 85-ft. servicing derrick is available as special equipment for use with the manufacturer's largest model oil-well spudder, the 48-L. The two-section, power-lowering telescoping derrick lays down over the spudder for fast road travel. Power raised, the derrick employs a built-in 4-part tackle and oversize derrick-hoist drum. In raising the derrick, 12 guy wires are set, four each from the lower section, the fingerboard, and the top of the derrick.

The fingerboard holds a total of 7,920 ft. of well tubing in 60-ft. stands. The derrick handles up to 60,000 lb. of tubing.

The new servicing derrick features a sturdy structural design similar to the standard 60-ft. 48-L derrick. The lower section consists of 12-in. channels and the upper section is made of laced angles to form 11-in. channels. Reinforcing is added at the hinge pin, and a casing-tackle strut is provided.

For more information write or call: Bucyrus-Erie Co., South Milwaukee, Wis.

●

Chain Wrench Useful For Close-Corner Work

This new line of chain wrenches is especially useful for close corner work

OIL AND GAS JOURNAL Showcase

.....OF NEW EQUIPMENT

on pipe sizes up to 6 in. The wrench jaw is constructed so that the greater the force on the handle, the tighter the grip. The rugged chain will fit round, hex, square, and all irregular shapes.

These tools are available in two models, ½ to 4 in. and 3 to 6 in. The chain wrench may be used effectively for holding or turning operations and will not scratch or mar surface of pipe or object held. **For more information write or call: The Toledo Pipe Threading Machine Co., Toledo, Ohio.**

●

Plastic-Gasket Material Seals Vacuum Lines

Vacuum-line sealing problems are being solved by a new plastic-gasket material. Users report that by adding 1/64-in. film or coating to flange faces and gasket surfaces, vacuum-line leakage is reduced to a minimum.

Any slight leakage which may occur after the line has been in service for some time can be corrected without dismantling flanges by applying 1/32 in. of plastic-gasket material around the outside surfaces of the flange where they meet with the gasket.

The material is offered in two formulations: one for air, steam, water, and mild chemicals; the other for gasoline, oil, and solvents.

For more information write or call: Flexrock Co., Packing Division, 3602-X Filbert Street, Philadelphia 1, Pa.

OIL AND GAS JOURNAL **Showcase Coupon**

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CITY _____ STATE _____

Please send me complete information on the following item

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Described in the Oct. 1, 1956, issue of The Oil and Gas Journal

NAME _____ TITLE _____

COMPANY _____

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BAKED-ON PLASTIC COATINGS

REDUCE PARAFFIN CONTROL COSTS

The glass-smooth surfaces provided by PLASTICAP Coatings make rods, tubing and flow lines almost wholly resistant to paraffin deposition. Even in the most stubborn cases, PLASTICAP Coatings let you operate for many months without the necessity of scraping. They eliminate the need for expensive solvents . . . put an end to time-consuming rod stripping jobs . . . remove the danger of cutting paraffin in high pressure wells. Production is greater because the co-efficient of friction is reduced, and because there is no back pressure on the formation caused by paraffin build-up in tubing and flow lines.

Compared with the cost of continual treatment, and daily, weekly or even monthly scraping jobs, PLASTICAP Coatings represent only a very small investment. And remember, they provide the *extra* benefit of corrosion control at no additional cost whatsoever.

FILL OUT AND MAIL COUPON . . .
for complete information on corrosion control services. PLASTICAP Baked-On Tubular Coatings, PLASTICAP Custom Coatings and Rubber Linings will save money in many services.

PLASTIC APPLICATORS, INC.
P. O. BOX 7631 HOUSTON 7, TEXAS PHONE UN-9-2491

Please send information on:
PLASTICAP Tubular Coatings ☐ PLASTICAP Custom Coating ☐ Rubber Linings ☐

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TWO PLANTS TO SERVE YOU
HOUSTON, TEXAS HARVEY, LOUISIANA

OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Insulation for Hot Underground Pipes. A new four-page, two-color brochure describes Gilsulate insulation for hot underground pipes. The brochure discusses the problems of underground-pipe insulation and explains how Gilsulate's special properties overcome them. On-the-job photographs illustrate ease of application; brief technical data are also included. **For more information write or call: American Gilsonite Co., Salt Lake City, Utah.**

•

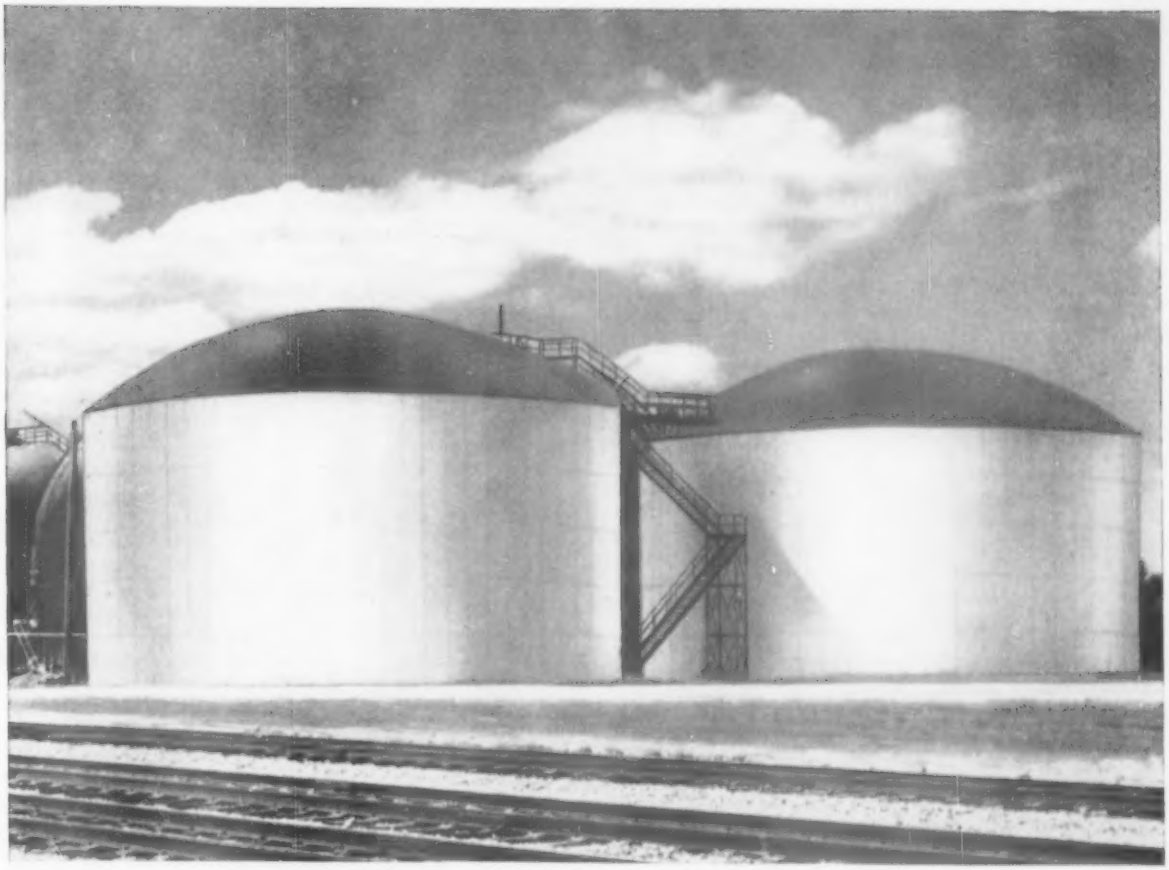
Dow Sodium Orthosilicate, an eight-page booklet, discusses various metal-cleaning applications of the chemical and concisely presents physical and chemical properties, packaging, and safety precautions. Sections on electrolytic and spray cleaning in the metal-cleaning field point up advantages of the chemical with special attention drawn to sodium orthosilicate's high electrical conductivity, good emulsification and saponification characteristics, and its high pH and acid capacities. Dip and soak cleaning is also reviewed. **For more information write or call: The Dow Chemical Co., Midland, Mich.**

•

Fin-Tube Heat Exchangers. Presenting the versatile Alcotwin fin-tube heat exchangers, this new two-color, eight-page bulletin describes the excellent heat-transfer characteristics of the longitudinal fin tubes. The tubes feature U-shaped fin channels integrally bonded to the tubes by heliarc welding. Included is a table of dimensions, a type designation table, and finside coefficient and finside pressure-drop charts for all sizes of exchangers. **For more information write or call: Alco Products, Inc., P. O. Box 1065, Schenectady, N. Y.**

•

Zinc Anodes Designed for Cathodic Protection. This four-page, two-color folder offers advantages, uses, and details on galvanic and marine anodes. Covering five anodes of each type, the leaflet gives dimensions, length, weight,



35,000 barrels of 83% ammonium nitrate solutions are stored without corrosion in these aluminum tanks. Development was a joint effort between **Sohio Chemical Co., Chicago Bridge & Iron Co.,** and **Aluminum Company of America.** Alcoa Aluminum Alloy 5052 is used for sidewalls in thicknesses up to 1⅛". The consumable electrode process was used for all welding.

SOHIO insures stable storage of 83% ammonium nitrate with two 35,000 barrel tanks of ALCOA ALUMINUM

Aluminum will not render ammonium nitrate unstable! That's why Sohio Chemical Company chose Alcoa® Aluminum for two special 35,000 barrel tanks used to store 83% ammonium nitrate solutions produced in a new $17-million petrochemical plant at Lima, Ohio. Now in full-scale production, the plant yields over 300,000 tons of ammonia and derivatives yearly.

Like so many other petrochemical producers, Sohio has found that Alcoa Aluminum provides an ideal answer to the problem of better, cheaper storage and handling of ammonium nitrate and nitrogen solutions. And the superior corrosion resistance of aluminum gives it extra-long service life under constant exposure to chemicals and plant atmospheres normally corrosive to most metals. That makes Alcoa Aluminum the least expensive material to solve storage and handling problems when product protection and corrosion resistance are vital.

The superior storage and handling performance of Alcoa Aluminum has been proved on-the-job in such diverse applications as these: fertilizer solution storage tanks, nitrogen chilling exchangers, prilling towers, tank cars, piping and drums. A new Alcoa book, *Process Industries Applications of Alcoa Aluminum*, contains 80 pages packed with performance and design data. To get your *free copy*, write to Aluminum Company of America, 904-K Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

and uses. Page four discusses the cathodic method of corrosion control, how it works, best working conditions, and life expectancies. **For more information write or call: American Zinc Sales Company, Paul Brown Building, St. Louis 1, Mo.**

●

LQ600 Valves with Brinalloy Seats and Disks. A new, four-page, three-color circular describes the two pressure classes of LQ600 bronze globe valves. For a wide variety of services from normal to exceptionally severe, the two valves are the Fig. LQ600-150 valve, rated at 150 lb. steam pressure, 300 lb. w.o.g., and the new Fig. LQ-600-200 valve, rated at 200 lb. steam pressure, 550° F., 400 lb. w.o.g. Both types are manufactured in eight different sizes, from ¼ in. through 2-in. diameters. Both are equipped with Brinalloy seats and disks that in 5 years of actual service in the field, have required no repair or maintenance. The Circular No. 602-2 lists all features of each LQ600 pressure class, and describes and includes the A.S.T.M. and A.S.M.E. specification numbers of the alloy used for the bodies and bonnets. **For more information write or call: Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.**

Walker-Neer Spudders. Presenting three spudder models, this eight-page, two-color brochure gives specifications, photographs, and details of each. The models are: the S-33 for 5,000-ft. drilling, 6,000-ft. workover; the S-32 Special for 3,000-ft. drilling, 4,000-ft. workover; and the S-32 for 2,000-ft. drilling, 3,000-ft. workover. Information for each model includes weight, dimensions, stroke, drum specifications, spooling capacity, and line pull and speed. **For more information write or call: Walker-Neer Manufacturing Co., Inc., Wichita Falls, Tex.**

●

Well-Cementing Tool Catalog. A new, illustrated 10-page, two-color catalog contains descriptive, installation, and operation data on a diversified line of primary cementing tools. In addition, this catalog offers helpful information on how to obtain a better cementing job. **For more information write or call: B and W Inc., Box 5266, Houston, Tex.**

●

National Type B Tubing Spider and Slip Assembly is described in the three-color, four-page Bulletin 465. Illustrated with photographs and cutaway drawings, the folder lists sizes and hinge and latch information. Dimensions are given in a line drawing. **For more information write or call: The National Supply Co., Two Gateway Center, Pittsburgh 22, Pa.**

●

Petrochemical Case Study Reports. A set of six insulation case-study reports illustrates how actual insulation problems in the petrochemical and petroleum industries were solved. The report, bound in a spiral binder, utilizes text, photographs, and detail drawings to explain installation procedures, insulation thicknesses used, and results in each case. **For more information write or call: Pittsburgh Corning Corp., One Gate Center, Pittsburgh 22, Pa.**

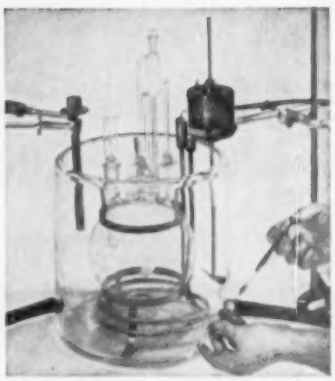
●

Automatic Recording Gas Detector. Illustrated and described in a three-color, four-page leaflet, this detector is installed at the well site for the geologist. With it the geologist can pin point possible productive gas and oil horizons as drilling progresses. The instrument automatically and continuously detects and records gas zones as they are encountered. **For more information write or call: Baroid Div., National Lead Co., 2404 Danville, P. O. Box 1675, Houston 1, Tex.**

NEW VAPOR EQUIVALENT APPARATUS

ACCURATE, QUICK VAPOR APPARATUS OF LP RESIDUES AND OTHER LIQUID ORGANIC SAMPLES

A new instrument which measures volume of vapor produced by a unit volume of liquid. Also determines molecular weights by an adaptation of the Victor Meyer method. Vapor equivalent determinations can be made of residues from natural gas samples, or of any liquid with a vapor pressure of more than 4mm. at the temperature of the vaporization bulb. Unit is compact, mounted within a glass constant temperature bath. Unit consists of a vaporization bulb with an integral multiplying manometer and a removable sample entry system consisting of an orifice and matching pycnometer. Bath is equipped with an electric heater.



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FIRE!

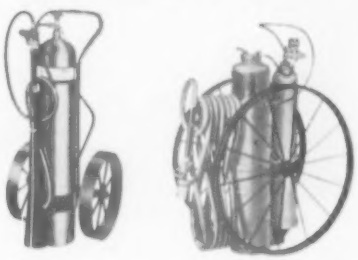
HOW TO DETECT AND EXTINGUISH IT IN SECONDS!

HAND PORTABLES

Carbon Dioxide | Foam Soda-Acid Clear Water Anti-Freeze | Pressurized Water Anti-Freeze | Dry Chemical

Kidde CO_2 portables, either trigger-release type or squeeze-valve type models, are available in sizes from 2½ to 20-pound capacities. New Kidde Wet Chemical extinguishers are available in 2½ gallon bronze or stainless steel models, including pressurized Water or Water-Anti-Freeze units (illustrated). Kidde Dry Chemical extinguishers are available in cartridge-operated models of 20 and 30 pound capacity or pressurized models of 5 and 10 pounds capacity.

MOBILE EQUIPMENT

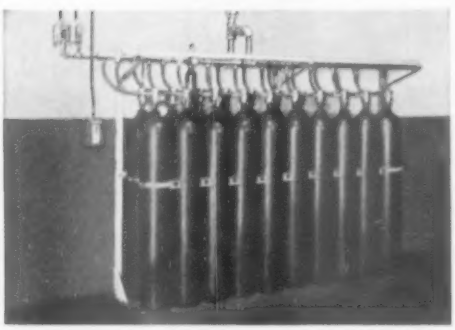


50, 75 and 100 lb. CO_2 Units | 150 lb. Dry Chemical Unit

For major fire hazards, get a mobile unit. Wheeled CO_2 units are available in 50, 75 and 100-pound capacities, in one cylinder.

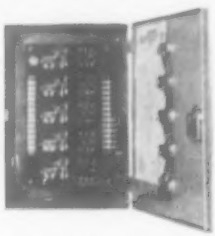
150-pound Dry-Chemical unit has straight stream for long range . . . fan pattern for wide coverage. Both units give expert results even with inexperienced operator.

CO_2 SYSTEMS



New Kidde pressure-operated CO_2 extinguishing systems are individually designed to fully protect even the most dangerous hazards, use no falling weights or clumsy mechanical triggering methods. Pneumatic Control Heads insure instant and complete CO_2 discharge. Directional Valves afford protection to more than one hazard using the same bank of CO_2 cylinders.

ATMO DETECTING SYSTEMS



Kidde-Atmo is a wide-area automatic fire detecting and warning system which works on the principle of rate-of-temperature-rise. It is ideally suited for cases where life protection is of vital importance, or where quick, early detection of fire in valuable materials is essential.

The very first hot breath of fire triggers the system, and sounds the alarm. In addition, the system can also close doors, shut off fans or blowers – all *automatically*.

What's more, the Kidde-Atmo system operates independently of regular power sources, will still give protection even if outside power fails.

Kidde

Walter Kidde & Company, Inc., 1054 Main Street, Belleville, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

EQUIPMENT MEN . . . in the News

Security and Dresser Name Two Top Executives

Carra L. Lane is the new president of Security Engineering Division of the Dresser Industries, with headquarters in Dallas, Tex. Lane's appointment follows upon the promotion of Ott Hammer to a vice presidency of Dresser Industries, Inc. Hammer has been associated with Security since its founding in 1931 and has been president of Security since May 1947.

C. L. LANE

OTT HAMMER

The announcement of Hammer's promotion was made concurrently with that of Lane's appointment to the presidency of Security by J. B. O'Connor, executive vice president of Dresser Industries. O'Connor stated, "The expansion of Dresser Industries in the drilling division of the petroleum industry necessitates additioaal executive talent at the top management level. Ott Hammer, with his long experience in the drilling field, acquired during an active career with Security extending back to 1931, will bring with him as operating vice president of Dresser Industries, a valuable executive ability and a close personnel knowledge of the oil-well drilling industry."

Lane comes to the presidency of Security from his former post of vice president and general manager of the Walker - Turner Division of Kearney & Trecker Corp. in Plainfield, N. J., a position which he has held since 1950.

Petroleum Factors, Inc. Offers Financial Service

A financial service new to suppliers in the exploration, development and production phases of the oil industry has been announced with the formation of Petroleum Factors, Inc., in Midland, Tex.

Petroleum Factors will purchase accounts receivable from individuals and companies regularly supplying services, materials and equipment used in locating, drilling, and equipping oil wells.

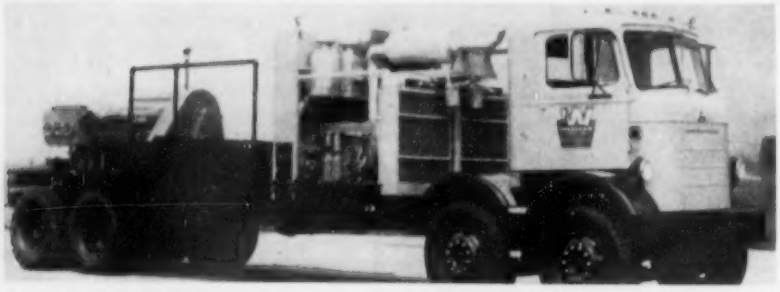
George C. Grimm, formerly district credit manager for a major oil-well-supply company, has been named executive vice president in charge of the company's home office in Midland. Other officers and directors are prominent West Texas businessmen.

Glitsch Appoints Tunno As New York District Manager

J. J. Tunno has been appointed manager of the New York district office for Fritz W. Glitsch & Sons, Inc., R. L. Allen, general sales manager, has announced.

Tunno was formerly district sales manager of the firm's Tulsa and Cleveland branches and was only recently transferred to New York. He was assistant to the district sales manager, Gordon Lindskog, who recently resigned from Glitsch.

Western Co. Puts Ten Pumpers In Service



Ten of these Mack-truck-mounted pumping units have been delivered to Western Co., Midland, Tex., for oil well fracturing work. Built to Western specifications, each Fracmaster 600 unit consists of an elongated eight-wheel Mack chassis with four-wheel drive. Two diesel engines mounted side by side furnish power for both the vehicle and the pumping unit, eliminating a need for an engine in the cab. The RB-80 pump at the rear is driven through two Mack transmissions, and a chain compound drive. The vehicle weighs about 46,000 lb.

Cal-Metal Announces New Pipe Mill for Louisiana

Cal-Metal Pipe Corp. of Louisiana has announced that it will install an electric-resistance-weld continuous mill to produce A.P.I., A.S.T.M., and A.W.W.A. specification line pipe at its Baton Rouge, La., plant.

The new mill will have a rated monthly capacity of 5,000 to 7,000 tons of standard and lightweight pipe in sizes ranging from 6 through 16-in. diameter. This facility will more than double Cal-Metal's present pipe manufacturing capacity. Completion of the expansion will raise the total annual capacity of the plant to more than 100,000 tons per year.

Five J&L Sales Districts Have Personnel Changes

C. W. Moore has been appointed supervisor of store construction and maintenance for Jones & Laughlin Supply Division, Tulsa, according to A. G. Bastian, manager, field sales division. Ben E. Irby has been advanced from storeman to local store manager at Gladewater, Tex., in the East Texas district.

In the Louisiana Gulf Coast district, Bill E. Trisler has been assigned to the division's newly constructed store at Morgan City, La., as local store manager. Succeeding Trisler at Lake Charles is Vincent P. Panepinto, formerly a storeman at Harvey, La.

In the South Rocky Mountain district, Marion D. McAfee and Curtis L. Sample have been promoted to local store managers at Sterling, Colo., and Casper, Wyo., respectively.

Billy J. Cox has been made local store manager at Estevan, Sask., in the firm's Canadian eastern district. Cox was formerly storeman at Anson, Tex.

Oilwell Opens Two Stores And Shifts Representative

Opening of two new stores in Kansas and the appointment of Thomas E. Dawson, 37-year veteran with the firm, as city representative at Wichita, Kans., have been announced by Mark Barkhurst, Mid-Continent area manager for the Oil Well Supply Division of U. S. Steel Corp.

The new branch stores are located at Liberal and at Hill City. The Liberal branch, to be managed by Russell R. Runyon, will serve fields in northern

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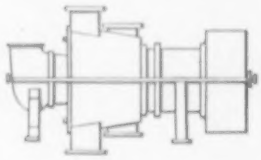

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*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

5000-hp gas turbine with cover removed.

Texas, the Oklahoma Panhandle, and southwestern Kansas.

K. P. Cecil, formerly at Ellinwood, Kans., will manage the Hill City store, established to serve fields in northwestern Kansas.

Dawson, who joined Oilwell in 1919 at Ponca City, Okla., has had more than 20 years of service in Kansas. His locations have included El Dorado, Russell, Ellinwood, and Great Bend.

BJ Pumps Announces Appointments, Transfers

R. A. Winsryg has been appointed regional manager of the Los Angeles region of Byron Jackson Pumps, Inc.; E. L. Lindsey has taken over as regional manager of the Houston area; Dean De Graffenreid has been appointed assistant regional manager at Houston to aid Lindsey.

Jack Stewart has moved from Houston to San Francisco to serve as assistant regional manager, assisting Don T. Metz, San Francisco regional manager. Randy Oram, sales engineer, has been transferred from New York to the Houston region as district manager, Dallas. These appointments and transfers were announced by N. D. Jesse, vice president.

American Iron Announces Personnel Changes

American Iron & Machine Works Co., Oklahoma City, has announced the following personnel changes:

P. L. Gillis has been made district manager for the Ark-La-Tex area with

P. L. GILLIS

BEACHUM

headquarters in Shreveport, La. David Beachum has been transferred from Ark-La-Tex district to Canada, where he is the Canadian district manager with headquarters in Calgary, Alta.

R. A. Eichor has been transferred from Oklahoma City to Seminole, Okla., and Jim Rea and T. J. Zimmerman have recently joined the American Iron sales force in the Kansas district, working out of Great Bend.

James Caffey has joined the sales staff to work in the Pampa, Tex., area and Felton Henry has been named to the West Texas district with offices in Odessa.

In addition, John May, Joe McGraw, and Ross Bonano, all with previous experience in the oil fields, have joined American Iron's sales organization. May will work in the South Louisiana district with headquarters in New Orleans; McGraw, working from Denver, Colo., will work in the Rocky Mountain district; and Bonano, with headquarters in Houston, will work in South Texas.

Dowell Promotes West, Davidson, and Pavlich

The promotions of S. R. West and R. D. Davidson to district engineers and of J. P. Pavlich to the position of petroleum engineer for Dowell Incorporated have been announced.

West will serve in the Kansas district under J. H. Cummin, district manager; Davidson will serve at Borger, Tex., under D. D. Parsons, district manager; and Pavlich will serve at Hobbs, N. M., under E. F. Kelly, district manager and R. W. Vutech, district area manager.

Joining Dowell in 1944 as analytical chemist, West was promoted to research chemist a year later and in 1947 to development engineer. He was transferred to Kansas in 1950 as service engineer at Great Bend. In 1954 he moved to Wichita as petroleum engineer.

Davidson joined Dowell in 1951 as junior service engineer at Borger. He was soon promoted to service engineer at Liberal but returned to Borger in 1954 as district petroleum engineer. During the past year he has been sales engineer at Liberal.

Pavlich joined Dowell at Hobbs as a junior service engineer, in 1952. Since then he has served the company in various capacities.

Mecom Joins Reed Roller Bit Board of Directors

J. W. MECOM

At a recent meeting of the Reed Roller Bit Co. board of directors, Houston independent oil operator John W. Mecom was elected a director, succeeding James Anderson, who died July 29.

Mecom owns interests in extensive oil producing properties in Texas and South Louisiana, and also operates in Columbia, Honduras, and Haiti. He owns Cron & Gracey, a drilling contracting firm, and three manufacturing

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Dowell scientist using the Optical Emission Spectrograph to get an accurate analysis of samples sent in from the field.

Which zone produced the water?

Analyzing brines and other waters to determine their formation sources is easy for this laboratory detective. Among the instruments at his disposal is this Optical Emission Spectrograph, capable of tracking down impurities as low as .0001 per cent in certain compounds. Instruments like this are in constant use by Dowell scientists as they search for answers to your well-treating problems.

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IN WATER FLOODING OPERATIONS

Water flooding systems demand rugged valves — and a lot of them — to assure reliable control of input flow. For years Hancock Valves have been helping to boost oil recovery economically with efficient throttling service in pump houses, on main headers and on injection lines.

Typical examples of the application of Hancock Valves in water-injection operations are pictured here. At Well No. 1, Mid-Continent Flood of the Sunray Oil Corporation, 616,874 bbls. of salt water were throttled through a single 1" valve in only 3¼ years at an average pressure of 850 lbs. It is one of many Hancocks in the system. Buffalo Oil Co., Wewoka, Okla. has been using Hancock Valves at Olympic Pool for seven years. So has Winona Oil Company of Delaware at Flat Rock Flood, northwest of Tulsa. Earlougher Engineering designed and supervised the installation of the Buffalo and Winona systems.

Whatever the pressure requirements or type of water, there is a tough Hancock Steel or Bronze Valve for the job. The "Flocontrol" types have 3-in-1 design that combines variable orifice, shut-off and index. All types and sizes are functionally engineered and precision built of the finest materials. They withstand wire drawing, galling, erosion and corrosion far longer than ordinary valves — *yet cost no more.* Even under the most adverse conditions of use, you can depend on the tightness of Hancock Valves month after month.

Hancock 600# Steel "Flocontrol" Valves Sizes: ¼" thru 4"

Hancock 600# Steel Valves Sizes: ¼" thru 2"

Hancock 800# Steel Gate Valves Sizes: ¼" thru 2"

When Hancocks go in, valve costs go down.

Hancock Bronze "Flocontrol" Valves Sizes: ¼" thru 2" 150# and 300# series.

Hancock Bronze Valves Sizes: ¼" thru 2" 150#, 200# and 300# series.

Phone your Industrial Supply Distributor for complete information about Hancock Valves for water-injection service. He will gladly help you select the right types and sizes for your particular requirements.

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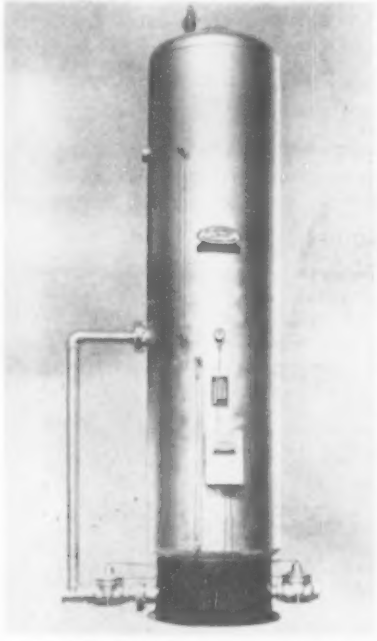
companies: Cardwell Manufacturing Co., Wichita, Kans.; Boonton Molding Works, Boonton, N. J.; and Polymer Engineering Corp., Alta Loma, Tex. In 1955 Mecom formed a partnership with San Jacinto Petroleum Corp., known as Mecom Petroleums, which operates both on and offshore in Louisiana.

The Mecom organization was organized in 1942 and since that time has made several major discoveries. With Richardson & Bass and Freeport Sulphur Co., Mecom participated equally in drilling the world's deepest test and deepest producing well, the LL&E No. 1-L at Lake Washington, drilled to a total depth of 22,570 ft.

Other members of the Reed board are S. P. Farish, chairman; J. S. Abercrombie; John Blaffer; R. G. Hamaker; Claud Hamill; J. W. Link; W. B. Noble; H. C. Tooley; and Wharton Weems. Hamaker is president of the company; Tooley, executive vice president; Noble, vice president, engineering; and Weems, secretary.

Big Metering Separator Shipped to Venezuela



This giant oil, water, and gas metering separator is being shipped to Western Venezuela by Oil Metering & Processing Equipment Corp. of Houston. The unit is designed to handle an extremely heavy viscous crude—so heavy the oil will hardly flow.

The metering separator weighs 4,200 lb., is 18 ft. high over-all, has a 48-in. diameter, and is 14 ft. from seam to seam.

The big metering separator has a working pressure of 125 psi., a measuring capacity of 10 bbl. per dump, and will handle up to 4,000 bbl. of oil per day. The oil metering accuracy rating is tested at 99.999 per cent.

J & L Supply Opens New Morgan City Store

The opening of this new oil-field supply store in the Louisiana Gulf Coast sales district of Jones & Laughlin Supply Division has been announced by Rainey Elliott, president of the Supply Division.

The structure, a mile east of Morgan City, La., houses two offices at the front and a warehouse at the rear. B. E. Trisler, formerly manager of the Lake Charles, La., store, has been appointed store manager and Loran W. Todd, formerly at Houma, La., has been assigned as sales representative. Assisting in store operations are: G. E. Bender, W. L. Herrington, G. R. Robinson, and P. T. Huddleston.

The Morgan City store will be under the over-all supervision of Clarence E. Rogers, Gulf Coast district sales manager.

A. M. Iverson Is Named to City Sales Post

A. M. IVERSON, JR.

The Iverson Supply Co., Tulsa, has announced the promotion of A. M. Iverson, Jr., to city sales representative for Oklahoma City. Iverson was formerly a field salesman for the company in Sherman, Tex. Iverson began working for the Iverson Supply Co. in Salem, Ill., as a warehouseman. For the past 5 years, he has worked as a warehouseman and field representative in the company's Farmington, N. M., store, and as a field representative and store manager in Price, Utah, prior to his last assignment in Sherman, Tex.

Diamond Chain Co. Elects New Officers

C. P. Kottlowski has been elected president and general manager of Diamond Chain Co., Inc., Indianapolis, Ind., succeeding Guy A. Wainwright, who became chairman of the board, replacing C. C. Jarchow. H. Norris Cottingham, vice president, was named assistant general manager; and G. E. Schloot was named vice president and director of personnel.

Kottlowski joined the company in 1916 and has been assistant general manager. Cottingham has been with the company since 1919. Schloot, formerly factory manager, has been with the company 39 years.

National Supply Co. Opens New Field Store at Borger

A new oil-field-supply store at Borger, Tex., has been opened by The National Supply Co., manufacturer and distributor of oil-field machinery and equipment.

The new store will serve drilling contractors and producers in the Texas Panhandle, including Hutchinson, Moore, Hartley, Dallas, and Sherman counties. These areas were formerly served by the company's Pampa, Tex., store.

W. P. Tatum, Jr., has been named manager of the store. It is under the supervision of J. G. Lovett, Jr., district manager of the Wichita Falls district.

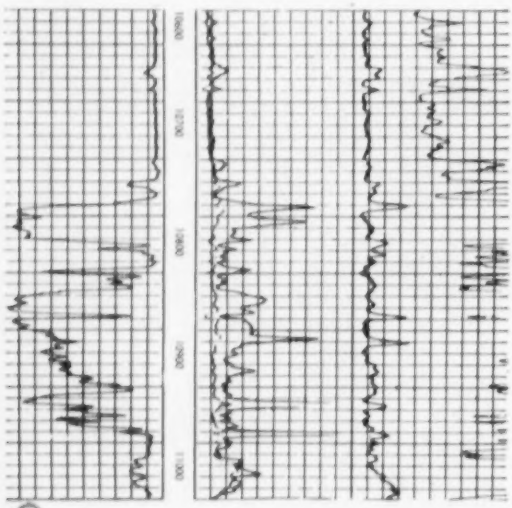
Orbit Makes One Sales Shift, Appoints Two

H. M. JOHNSON

One major change and two new appointments in sales personnel have been announced by L. E. Wallace, general sales manager for Orbit Valve Co.

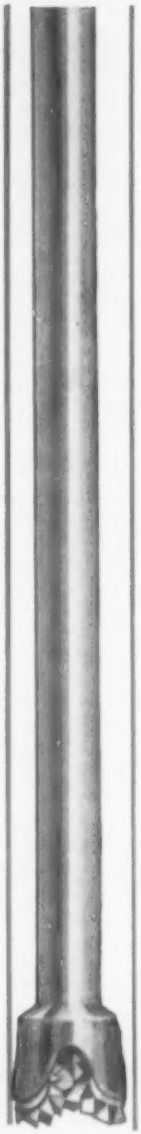
Howard M. Johnson is being transferred from Corpus Christi, Tex., to Lafayette, La., where he will service South Louisiana and Mississippi. Bill J. McDonald has been appointed to replace Johnson at Corpus Christi. Norman E. Lamp has been appointed to service Illinois, Indiana, Michigan, Kentucky, and Tennessee for Orbit. He will headquarter at Carmi, Ill.

❶ Section of Well No. 1, logged in a lime base, oil emulsion system. Log in this mud offers some interpretation and correlation problems.



❷ Well No. 2, with paralleling strategraphic structure, was drilled with a DRISCOSE low solid emulsion system. Observe the improved spontaneous potential curve on the left. Furthermore, no mechanical or gelation problems.

DRISCOSE*



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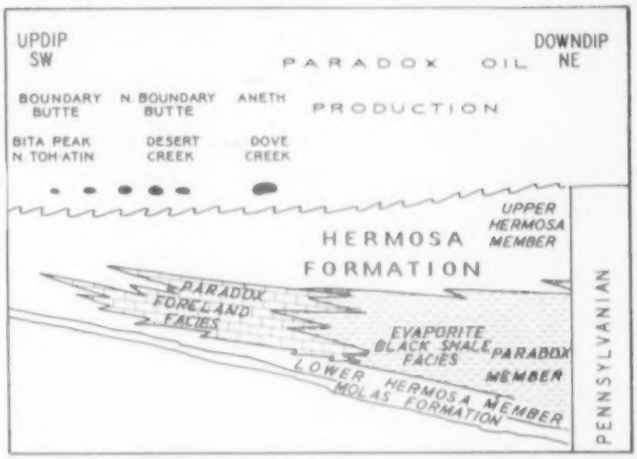


SINCE EARLY 1956, the Four Corners area has had eight Pennsylvanian oil discoveries (denoted by stars). The stratigraphic cross-section shows that the producing zones in most of these new fields are confined to the foreland facies. Later uplift has altered this simple relationship.

Eight Paradox Strikes . . .

Is a Perfect '56 Score in Prospect?

by Norman S. Morrisey
Drilling-Development Editor

OIL finders in the Paradox basin are bowling strike after strike. Already the score stands at 8 for 1956.

The latest strikes stretched the rapidly expanding Aneth trend from 4 miles to 18 miles. Shell Oil Co. 1 Recapture Creek (20-40s-23e) flowed oil at the rate of 30 bbl. per hour on drill-stem test of the Pennsylvanian Hermosa. The discovery lies almost 5 miles west of Aneth, the most important oil field discovered in the Rockies since the Williston basin. Nine miles to the east, The Texas Co. has an indicated strike at its 1 Navajo "J" (20-40s-26e). A drill-stem test of the Paradox formation recovered 54 bbl. of oil in 4 hours and 25 minutes.

Gulf Oil Corp. is currently testing an edge well at Aneth that will extend the field 1 mile to the northwest.

New approach rewarding . . . Until recently in the Paradox basin, oil companies concentrated on the more obvious surface structures in looking for Pennsylvanian oil. There are many huge salt anticlines that are evident on the surface. At first glance, these appeared to be the best places to drill for oil. The results, however, proved otherwise. Some did produce minor amounts of Paradox oil.

But behind the scenes the stratigraphers were unraveling the mysteries of the Pennsylvanian sedimentation. They knew that a large shallow marine sea once covered the Four Corners area during Pennsylvanian time. Parts of the area received a black-shale sequence of beds. Updip this shale facies graded into a limestone-dolomite-evaporite sequence. Farther updip the lithology changed into a clastic or dominantly sandstone and shale group of sediments.

The downdip black-shale facies might be a source for the oil, but this sequence has few if any reservoirs. The extreme updip sandstones and shales offer some hope for production.

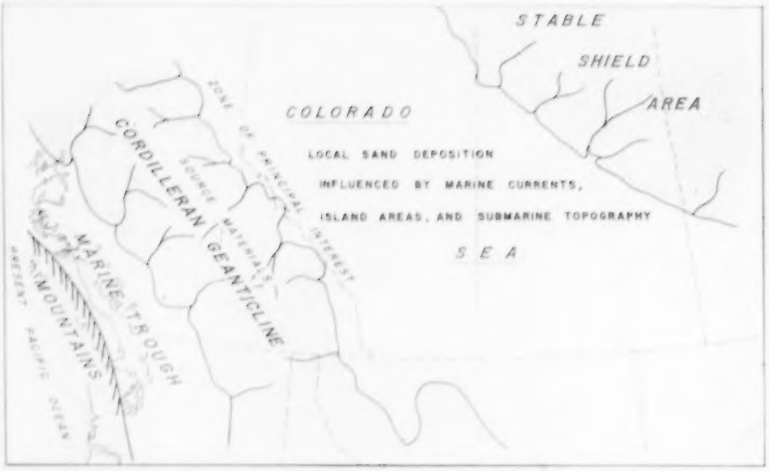
But the intervening group of rocks offered excellent chances for oil production. Within the limestone-dolomite-evaporite group are porous rocks that could trap the oil. Reefs actually are present on the outcrops. These reefs occur in trends and for the most part are confined to the Paradox formation. This group of limestones, dolomites, and evaporites, termed the foreland facies by stratigraphers, should harbor oil reserves.

This line of reasoning was applied to the Paradox basin. Well control enabled the oil finders to locate a belt about 30 miles wide, trending northwest-southeast, where the foreland facies should be present. Geophysical work, surface mapping, and subsurface mapping pin pointed drillable prospects.

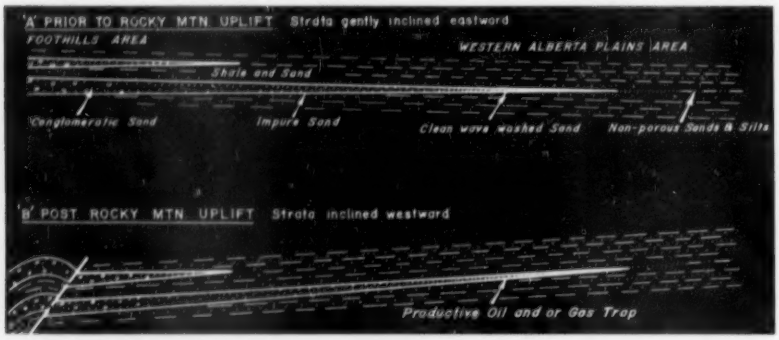
Large reserves uncovered . . . Has the approach been successful? The 1956 record answers yes. The oil finders almost certainly have established where the porous belts in the Hermosa and Paradox occur in the subsurface. They have found eight places where these zones produce.

Aneth is the largest Paradox oil field discovered to date and it is growing rapidly. Discovered early in 1956 by The Texas Co., Aneth is now 5 miles long with only one duster, a low dry hole 1½ miles east of the nearest production. Although it is still too early to guess the ultimate size of Aneth, certainly it should develop into a sizable oil reserve. The relatively thin pay zone, only 40 ft. thick, may be the only obstacle to Aneth's becoming a major oil field with 100 million barrels of recoverable reserves.

Will 1956 see a perfect 12 strikes bowled by oil finders in the Paradox basin? They are looking for more Aneths in the Paradox basin. They want that "300 game." The chances are good that they will get it.



WESTERN CANADA diagrammatic paleotopographic map, approximate Cardium time. Fig. 1.


'A' PRIOR TO ROCKY MTN. UPLIFT Strata gently inclined eastward
FOOTHILLS AREA
WESTERN ALBERTA PLAINS AREA
Shale and Sand
Conglomeratic Sand
Impure Sand
Clean wave washed Sand
Non-porous Sands & Silts
'B' POST ROCKY MTN. UPLIFT Strata inclined westward
Productive Oil and or Gas Trap

DIAGRAMMATIC CROSS-SECTION of Cardium sand development as an oil and gas reservoir. Fig. 2.

In Canada's Pembina area . . .

Cardium Sand Potential Reaches 2 Billion Barrels

by J. C. Sproule and O. D. Boggs

THE Cardium sand formation reservoir of Pembina and adjoining oil fields is the largest single known oil reservoir in Canada, with one exception. That exception is the reserve in the McMurray oil sands of northern Alberta, which is generally conceded to be the largest known oil reserve.

An important difference between the two is, of course, that the Cardium sand oil reserve is commercial, whereas the McMurray sand reserve has not yet been proved to be commercial. The most important similarity between the two sand bodies is that they are both quartz sand reservoirs, outwash and to some extent deltaic in origin, and that both bodies owe their reservoir porosity to purification by winnowing of what would otherwise be a dirty, relatively nonporous sand. Both deposits are clear-cut examples of the idea that "oil is where you can find a reservoir for it."

The Cardium reservoir of Pembina field was discovered in May 1953, by the drilling of Socony-Seaboard 1 Pembina, a wildcat well located approximately 70 miles southwest of Edmonton. Since then, over 1,300 successful Cardium wells have been brought into production in and close to Pembina field. Now, over 100 drilling rigs are operating in Pembina field and along the related Cardium trend. To date approximately 780 million barrels of oil have been proved within the limits of Pembina field, whereas outlying Cardium fields have proved up over 30 million barrels.

Probable extensions to Pembina field should account for an additional 275 million barrels and present industry thinking is that an additional 500 million barrels will be added as secondary recovery oil, to bring the total recoverable to 1,500 million barrels.

This has all taken place within 3 years, along a sand trend that extends for several hundred miles. Furthermore, the area under discussion is in general relatively difficult of access in the summer, thus restricting exploration and exploitation activity. Using this as a background for estimates of future reserves it seems most reasonable to assume that an additional 500 million barrels of oil will be found in the Cardium within a relatively few years, thus swelling the reasonable total to 2 billion barrels of recoverable oil.

The distribution of the Cardium sand body and location of the presently known Cardium oil discoveries are shown on the accompanying Figs. 3 and 4.

The purpose of this article is to present an interim report on the existing status of the Cardium play, with particular reference to the future oil possibilities of this reservoir. No attempt has been made to reproduce a full summary of the geological and engineering factors involved in the appraisal. For such a background the reader is referred to the publications listed in the accompanying bibliography. For our present purpose it should suffice to highlight only those factors that have most to do with our appraisal of the future potentialities of the Cardium sand.

With this in mind, we refer you to a careful study of the accompanying illustrations, inasmuch as these few illustrations are, in our opinion, more informative than a massive text.

Forecast Thinking

The Cretaceous geological section of the western interior Plains is composed of a series of marine and brackish shales, sands and sandy shales, with some sediments of fresh-water origin. The late Lower Cretaceous and Upper Cretaceous portion of the sedimentary cycle includes mainly marine shales of the Colorado group. These shales are deposited over a vast area, extending from the Gulf of Mexico to the Arctic Ocean, in the most wide-

Authors are with J. C. Sproule & Associates, consulting geologists and engineers, Calgary, Alta.

STRUCTURE CONTOURS of Cardium main sand. Fig. 3.

ISOPACH, Cardium net porous sand. Fig. 4.

spread interior sea of the Mesozoic period. In Alberta and vicinity this marine-shale section is divided into two parts by the Cardium formation, which is a three-member assemblage composed of an upper and lower conglomeratic sand member and an intermediate sandy-shale member.

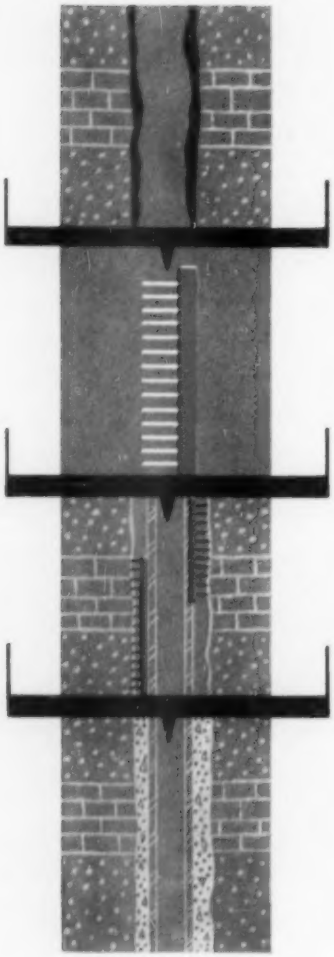
The key to the existence and distribution of the Cardium as a hydrocarbon reservoir lies in the geological history of the Cordilleran geanticline, a highland that formed the western shore of the Colorado Sea and whose oscillating rise and fall controlled the supply of coarse clastic sediments forming the Cardium conglomerate sand member.

In illustration of this point, see Fig. 1, a paleogeographic restoration of western Canada at the time of deposition of the Cardium formation. This illustration indicates that the coarser clastic unsorted sediments will tend to be piled close to the western shoreline of the Colorado Sea. In the deeper waters to the east of this shoreline, sediments deposited are more uniformly graded sands of progressively smaller grain size, with areas of well-winnowed or wave-cleaned sands that form the more porous reservoirs.

The Cardium owes its existence as a reservoir sand to the tectonic history of the area. In this connection, Fig. 2, an east-west diagrammatic cross-section of the shoreline area, shows: (1) the easterly dipping attitude of the Cardium during its deposition; and (2) the westerly dipping attitude of the formation from the Plains to the edge of the foothills, following the uplift and eastward overthrusting of the Rocky Mountains and consequent downwarping of the underthrust portion of the crust.

The net result is an ideal stratigraphic trap that permits migration laterally and upward only in the direction of the pinchout of the sands, as the porous sand body is gradually replaced eastward by nonporous shales. Pembina area Cardium-sand oil pools are the natural outcome of the process described. The reservoir is in the eastward pinchout portion of the lower of two conglomeratic sand members.

Although a detailed discussion of the geology of the Cardium formation is not required here, it is essential to an appreciation of the potentialities of the sand that it be understood that, even though the shoreline sand may be a practically continuous ribbon, the porous reservoirs contained therein are discontinuous. The undulating character of the submarine surface on which the sand was laid down, variations in source of supply, and the topographic relief on and adjacent to the Cordilleran geanticline (Fig. 1), as well as water currents and variables, all contribute to cause local variations in the thickness, attitude, grain size, porosity, and permeability of the sand body.



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With this in mind, a study of the regional paleogeographic features is important to a full understanding of this and similar sand occurrences.

In relation to the above concept of the dominant influence of paleogeography in the formation of the porous reserves you are referred once more to Fig. 1. Semidiagrammatically the distribution of streams and promontories related to the Cordilleran Highland sedimentary source are illustrated. The positions of these same streams with respect to specifically known sand reservoirs is beginning to take shape as the evaluation of knowledge of the Cardium-sand pinchout proceeds, as indicated on Figs. 3 and 4, both of which show the sand reservoir body extending eastward from Pembina, Rocky Mountain House-Alhambra, and Garrington fields as narrowing ribbons of sand, related to the parent outwash in each case.

The occurrence that crosses Leduc-Woodbend field has been known for several years, although its true significance is only developing currently. The eastward extension of the Rocky Mountain House-Alhambra sand body is a new development, having a suspicious connection with another Cretaceous reservoir, the Viking sand in Joffre-Gilbey field.

The oil-exploration industry in western Canada will, in view of the above, undoubtedly give careful attention to any further anomalous conditions as they appear along the Cardium pinchout trend.

Conclusions

The Cardium sand as an oil reservoir has only been known for a little over 3 years. In that period, however, over 780 million recoverable barrels of oil have been indicated in the Pembina pool above, with substantial reserves appearing in related oil fields along the same trend.

It is estimated that extensions to the presently known area of Pembina field will probably account for another 275 million barrels of recoverable oil, which would swell the total of reserves in sight, recoverable by primary methods to 1,055 million barrels.

Secondary-recovery methols, as presently visualized, are regarded tentatively as being capable of adding an additional 500 million barrels to Pembina field, thus bringing the total of Cardium oil reserves in sight to 1,555 million barrels.

Considering the fact that the above oil has been discovered by drilling of a stratigraphic-type trap, in an area that is difficult of access along a trend that is several hundred miles in extent, over the short period of 3 years, it seems reasonable that we can add at least an additional 500 million barrels of recoverable oil, to be discoverd over the next 10 to 15 years. If that should take place, the Cardium would have accounted for over 2 billion barrels of recoverable light-gravity crude oil, a sizable reserve for a single sand body.

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EXPLORATION HIGHLIGHTS

GREAT LAKES

MICHIGAN

Second Traverse (Alpena) oil producer in South Buckeye pool, Gladwin County, was acidized with 500-gal. and under test, after well flowed at the rate of 4 bbl. of oil an hour natural before being tubed.

New producer is the Jack Long 2 Shumway, SW SW SE 24-18n-1w, Buckeye Township, north 10-acre offset to the Alpena Traverse discovery well in this older Dundee pool.

Traverse at the 2 Shumway was logged at 2,767 ft. Alpena top was picked at 2,891 ft. Oil pay was drilled between 2,897 ft. and total depth, 2,898 ft. While the 2 Shumway did not flow as hard natural as the Carlson & Sole 1 Oard discovery, it did show strong enough that acid treatment is expected to bring it up to a capacity equal to or better than the discovery.

Meanwhile, the diagonal northeast offset to the 1 Oard and the east offset to 2 Shumway missed a Traverse oil pay and was being drilled below 3,250 ft., headed for Dundee objective. This Traverse failure is Carlson & Sole 1 Doane, SW SE SE 24-18n-1w.

The 1 Oard discovery, drilled Traverse oil pay at 2,891 ft., was completed good for 100 bbl. a day natural from an open, uncased, untubed hole and is as yet being produced in this manner, with very little change in flow rate.

APPALACHIAN

PENNSYLVANIAN

In Young Township, Indiana County, Southwest Pennsylvania Manufacturers Light & Heat Co. 4336 Stewart and R. & P. Coal Co., wildcat completed in the Oriskany sand gaging 10,900,000 cu. ft. gas, TD 7,498 ft. An offset to this well has been started by T. W. Phillips Gas & Oil Co. 3 Fee (Neal surface), Elders Ridge Quadrangle, .70 mile south of latitude 40 degrees 35 minutes, 2.38 miles west of longitude 79 degrees 15 minutes, elevation 1,200 ft.

WEST VIRGINIA

- Dry Fork district, Randolph County, West Virginia, Hope Natural Gas Co., 9986 West Virginia Evergreen Co., elevation 3,023 ft., gaged 2,037,000 cu. ft., gas after second fracture, chert 4,695 ft., Oriskany sand 4,847 ft., gas 5,017-21 ft., TD 5,150 ft.

- Triadelphia district, Logan County, Columbian Carbon Co., completed a large gasser in the Big lime gaging 21,944,000 cu. ft., natural, TD 2,435 ft.

Exploration this week

Great Lakes	153
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Successful Wildcats	176

EASTERN KENTUCKY

In Leslie County, United Fuel Gas Co. has a possible wildcat discovery at their 27 Fordson Coal Co. Corniferous lime topped at 2,792 ft. showed gas in several zones to a total depth of 2,962 ft. At that depth gas gaged naturally at the rate of 133,000 cu. ft. daily. Operators plan a fracture treatment.

OHIO

East Ohio Gas discovered indications of another gas pool in Chippewa Township, Wayne County, this time near Marshallville. On I O. M. Wertz, Section 3, White Clinton was found at 3,777-95 ft. with 100,000 cu. ft. natural and 600,000 cu. ft. after fracture.

- Another east extension to the rich pool east of Gratiot in Hopewell Township, Muskingum County, was completed by C. W. Collins et al on 1 C. E. O'Neal, Lot 33. Clinton was logged at 3,115-70 ft. with 3 bbl. natural and 300 bbl. in a 24-hour test after fracture.

- In Marne pool, Pennoco Oil 4 Fred Leslie, Lot 3, Madison Township, Licking County, drowned out in the Newburg sand and was continued on down to the Clinton. The sand at 2,628-70 ft. gaged 250 bbl. in the 24-hour test after fracture.

ROCKY MOUNTAIN

COLORADO

Arbuckle Test Slated For Crowley County

Sid Katz and Joseph Clarr will drill five wildcats in the southeastern part of the Denver basin in Crowley County. The first well is rigging up at 1 Bailey in NE NE SW 30-19s-57w. The wildcat will look for the Arbuckle at 7,400 ft. Very little drilling has been done in the region.

Wildcat Spudded Near Bent County Discovery

D. D. Harrington 1-A Schneider in C NW SE 9-22s-48w, Bent County, is drilling at 1,800 ft. This is a test 5 miles east of the 1-A Earl Lower Pennsylvanian gas dscovery.

UTAH

Paradox Pace Quickens

Three wildcats in San Juan County, southeastern Utah, held regional exploratory interest last week.

Shell Oil Co. 1 Recapture Creek, NW SE SE 20-40s-23e, recovered 60 ft. of heavily oil and gas-cut mud and 1,213 ft. of heavily gas-cut oil on 2-hour drill-stem test at 5,353-80 ft. On test at 5,327-80 ft. the well flowed oil at the rate of 350 bbl. per day. This new Aneth area discovery is 6½ miles north of North Desert Creek, 5 miles west of Aneth itself, and 3 miles south of Bluff Unit. This new Shell well plus The Texas Co.'s 1 Navajo J in 20-40s-26e, San Juan County, expands the producing trend in the Aneth area to 18 miles, east-west.

Gulf Oil Corp. 1 West Isnay-Federal in C NW NW 18-40s-24e, west of Aneth field, recovered 1,398 ft. of gas-cut free oil on 3-hour drill-stem test in the Hermosa. Tested depth was 5,916-6,026 ft.

The Texas Co.'s 1 Navajo-J discovery in 20-40s-26e, is coring at 5,711 ft. after flowing 54 bbl. of oil in 4 hours on a test at 5,570-5,661 ft. Location of the "J' well is 9 miles east of Aneth, separated by a dry hole.

PACIFIC COAST

CALIFORNIA

Richfield Scores Twice at Wheeler Ridge

Richfield Oil Corp. chalked up two new discoveries in the Wheeler Ridge-

THE OIL AND GAS JOURNAL

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Tejon field region of southern Kern County.

Richfeld 16-30 Mohawk - Wheeler Ridge Community, located a little more than ½ mile northeast of their Windgap new pool discovery, was being completed as a new Pulv sand pool discovery. It swabbed 161 bbl. daily rate of 30.7°-gravity oil from perforated intervals at 5,373-5,604 ft. and 5,648-9,904 ft. Total depth is 9,777 ft. plugged back to 5,905 ft.

The other new pool discovery was scored by 14-27 ROC-KCL-G, located on the east edge of the Wheeler Ridge field production in 27-11n-20w. It was completed flowing 861 bbl. daily of 37.4°-gravity crude from 8,731-8,800 ft. and 8,831-63 ft. for a deeper pool find that in that part of Wheeler Ridge field. The well was originally drilled to 10,940 ft. as an unsuccessful Eocene test. It was then plugged back and redrilled to 8,865 ft., its present depth.

Two New Gas Pays For Glenn County

General Petroleum Corp. was preparing to dually complete 1 Kennedy for a new gas pool discovery in the Beehive Bend region of Glenn County in northern California. This wildcat, located in SE NW 15-19n-2w, which is about 1 mile west of Beehive Bend gas field, flowed 2,215 M.c.f. of gas daily through a 74/64-in. choke on a drill stem test of the interval 5,207-17 ft. and flowed at the rate of 6,750 M.c.f. daily through the same size choke on a test of the interval 5,678-99 ft.

Humble Oil & Refining Co. also scored a new gas pool discovery in Glenn County with a wildcat, 2 Mamie H. Porter, on the north flank of the Princeton gas field. Humble completed the well flowing dry gas at a rate of 4,916 M.c.f. daily through a ⅜-in. choke from selectively perforated intervals between 5,980 and 6,248 ft.

HUGOTON EMBAYMENT

TEXAS PANHANDLE

Prolific Atoka Strike Finaled in Hansford

The Texas Co. completed its 1 E. M. Carmody in Hansford County, flowing 1,783 bbl. of oil per day on 1-in. choke. Total depth was 7,170 ft. and the well was plugged back to 7,136 ft. and perforated at an interval of 7,099-7,116 ft.

This rank wildcat discovery is 9 miles northeast of Spearman. Nearest production is from gas sands about 2 miles northwest.

Griffin Scholarship Award Announced by S.E.G.

The Griffin Scholarship in Geophysics has been awarded to Ramil C. Wright, of 4631 St. Ferdinand Drive, New Orleans, La., it was announced by F. J. Agnich, chairman of the student membership committee of the Society of Exploration Geophysicists. The 4-year scholarship, awarded annually to the son or daughter of an S.E.G. member by the Griffin Tank & Welding Service of Dallas, provides $750 per year to the recipient toward tuition and other expenses.

This year's winner is the son of Ronald E. Wright, seismic supervisor for General Geophysical Co., New Orleans. He is a graduate of John McDonough Senior High School in New Orleans where he received a Certificate of Merit in the National Merit Scholarship competition and a $100

scholarship in the Presbyterian Church College competition. He was also an officer in the band organization, treasurer and president of Hi-Y at John McDonough. He received a medal from the YMCA for basketball participation and was elected to the Order of Arrow as an Explorer Scout. Wright was enrolled at Rice Institute, Houston, Tex., where he will study geophysics.

● **The Mayhew Scholarship** in Geophysics has been awarded to Richard F. McReynolds, 1205 East Lons Street, Brownfield, Tex., it was announced recently in Dallas by F. J. Agnich, chairman of the student membership committee of the Society of Exploration Geophysicists. The 4-year scholarship totalling $3,000, is awarded annually to the son or daughter of an S.E.G. member by Mayhew Supply Co. of Dallas.

This year's winner is the son of P. T. McReynolds, an engineer for Humble Oil & Refining Co., Brownfield. He is a graduate of Brownfield High School where he was a member of the interscholastic debate, typing and ready writing teams. He was also vice president of the Spanish Club, and was president of the Presbyterian youth organization. McReynolds has enrolled in geophysics at Colorado School of Mines, Golden.

WESTERN CANADA

ALBERTA

Sundre Region Growing Rapidly

The Sundre-Westward-Ho region of southern Alberta, that was tagged with great potential for both gas and oil production by industry experts during pipeline hearings conducted last year, is rapidly developing into a producing area of major importance, as two wildcats in that portion of the province indicated further extensions to that oil and gas bearing area during the past week. One of the discoveries was operated by Hudson's Bay Oil & Gas Co., Ltd., and indicated oil production during drill-stem tests carried out in the Mississippian formation; while the other also tested the same formation and indicated condensate bearing gas production.

The Hudson's Bay well, 1 Eagle Hill venture, on LSD 7, 30-33-4w5, lies 2 miles north of the main development sector of the Westward-Ho oil field and is 3 miles east of the southern end of the Sundre producing sector. Drill-stem test results in the discovery formation showed 30 ft. of clean oil and 450 ft. of oil and gas-cut mud and 720 ft. of mud and gas-cut water cushion.

Great Plains' discovery well, 7-29 Eagle Hill is on LSD 7, 29-32-3w5. It lies 6½ miles south-southeast of the Westward-Ho oil field and 9½ miles southeast of the Hudson's Bay strike. This discovery well flowed condensate bearing gas at rates up to 3,780,000 cu. ft. daily during drill-stem tests and recoveries up to 630 ft. of condensate were made.

This general producing area, which is presently comprised of three separate fields, namely, Sundre, 55 miles north-northwest of Calgary, Westward-Ho about 3 miles closer to the city and Harmattan-Elkton 43 miles north-northwest of Calgary, will be serviced with pipeline facilities in the very near future. Cremona Pipeline Co., a Calgary independent backed by Home Oil Co., Ltd., and associates, was successful in its application to link this area with Calgary refineries and is currently in the process of filling that line with crude for immediate deliveries.

Gas Discovered At Manawan Lake

Sharples Oil (Canada), Ltd. has discovered gas in the basal quartz for-

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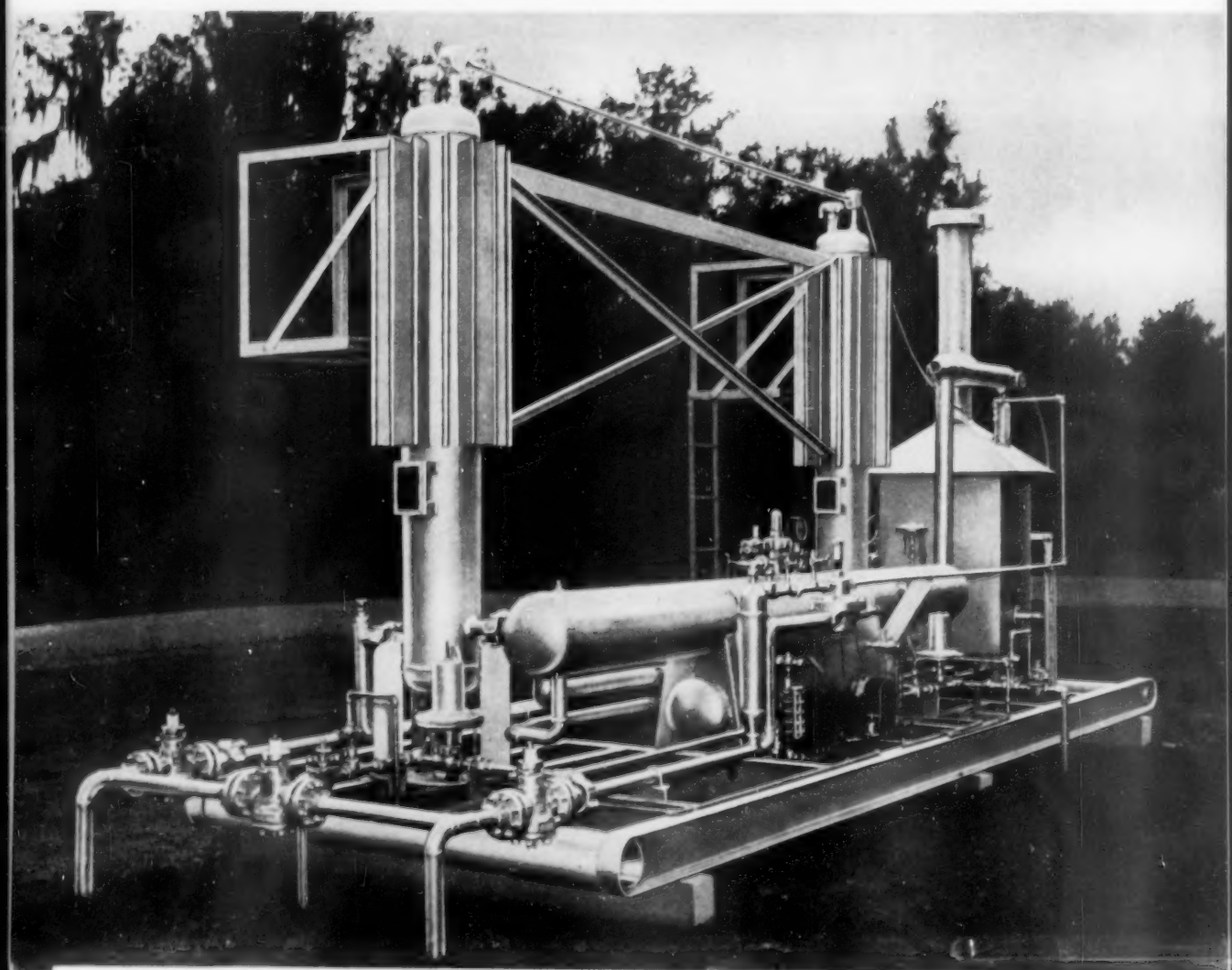

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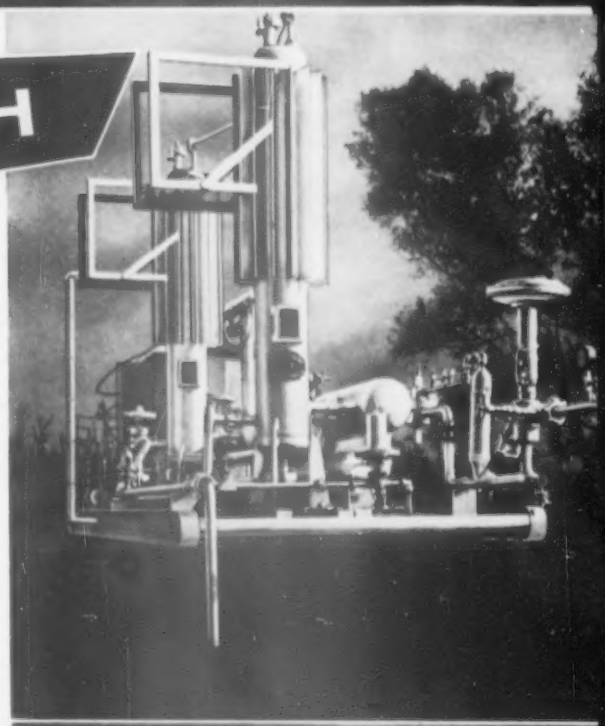

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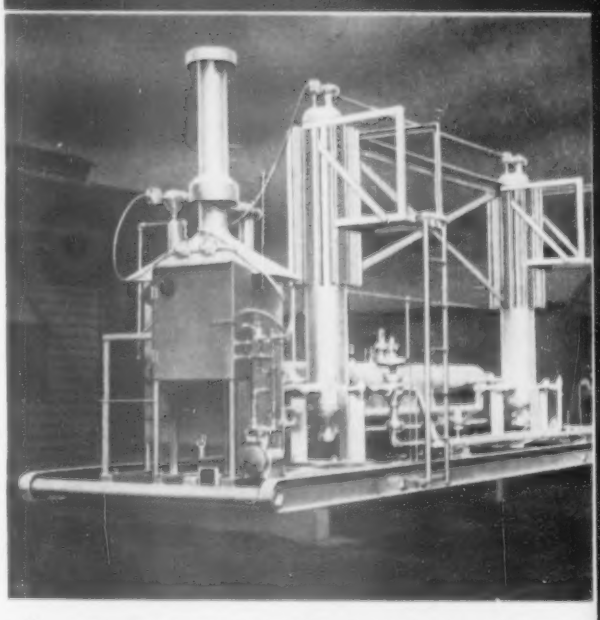

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mation at its most recent Alberta exploratory test. This strike for the company was drilled in the Manawan Lake area, 18 miles north of Edmonton and 4 miles west of the Morinville field gas wells.

The well, Sharples 14-18 Manawan Lake, on LSD 14, 18-56-25w4, was drilled to a completion depth of 4,502 and after Devonian formation drill-stem tests yielded only salt water, was plugged back to the basal quartz formation and capped as a potential producer.

Tests in the basal quartz horizon covered a 65-ft. interval and gas recorded at the surface at rates up to 3,415,000 cu. ft. daily. Salt water was recorded on the last tested interval.

Good Production Rates At Two Discoveries

Canadian Oil Companies, Ltd., have indicated good production rates at a pair of discoveries in Alberta according to official reports received from that company recently. One of the wells lie in the Innisfail area, 19 miles southwest of Red Deer city limits and 3 miles west of Innisfail town, while the other is midway between the oil fields of New Norway and Duhamel approximately 48 miles southeast of Edmonton. The Innisfail well was completed in the basal Cretaceous and indicated a flow rate of 480 bbl. per day through a 9/64-in. choke. Meanwhile, the Duhamel well flowed at the rate of 28 bbl. per hour from the D3 horizon.

White Rose-C. & E. 11-11 Innisfail, is located on LSD 11, 11-35-1w5, and the oil at this hole is coming from two perforated sections totalling 13 ft. The other well, White Rose-Supertest 10-7 South Duhamel, on LSD 10, 7-45-21w4, indicated a 42-ft. pay sector in the D3 and a 10-ft. interval was perforated for production tests. Both wells are continuing production test operations.

EASTERN INTERIOR

ILLINOIS

In Clay County Stortzum & McKinney and Calvert Drilling Co. have a discovery at 1 Stortzum in SE NE SW 12-5n-6e, 2 miles northwest of Bible Grove. The well swabbed 316 bbl. of oil, natural, in 8 hours from the Rosiclare lime at 2,795-2,803 ft.

• In Jasper County, 2 miles south of St. Marie, John W. Rudy 1 Williman, NW SW NW 1-5n-10e, pumped 106 bbl. per day, natural, from the McCloskey lime at 2,836-40, 2,849-51, 2,853-55 ft.

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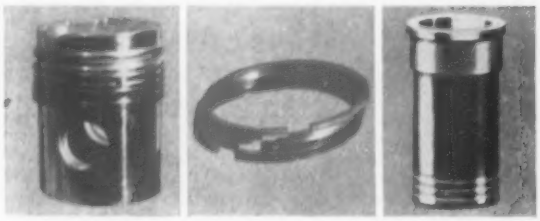

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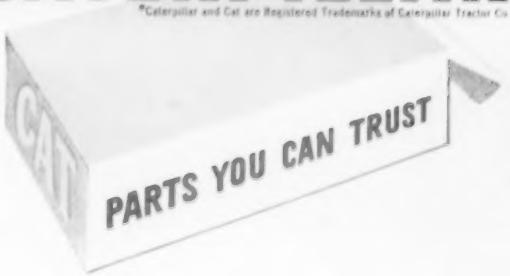

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MID-CONTINENT

OKLAHOMA

Distillate Recovered At Kingfisher Strike

L. H. Armer and Stanolind Oil & Gas Co. will test the Mississippian lime at 1 Gazin in C NE NW 14-17n-7w, northeast of Dover pool, Kingfisher County. This indicated Chester-Mississippian gas-distillate discovery flowed 11,000 M.c.f. of gas per day on drill-stem test at 7,107-27 ft. Recovery was 85 ft. drilling water and 3 ft. of distillate.

Second Test Made at Stephens Discovery

Second test has been made at Magnolia Petroleum Co.'s indicated Briscoe sand discovery east of Marlow in Stephens County. The 1 Scott, NW SE SE 14-2n-7w, flowed 6,582 M.c.f. of gas per day and 20.8 bbl. of oil per hour on test of the Briscoe sand at 8,350-93 ft.

The first test made at the well 2 weeks ago flowed 10,000 M.c.f. of gas per day at 8,315-73 ft. Recovery was 378 ft. of oil.

NORTH TEXAS

Jones County Well Opens Pool North of Hamlin

Sunray Mid-Continent Oil Co. 1 Harriette Hill has opened discovery production from the Swastika ½ mile north of Hamlin, in northwestern Jones County. Location is in Section 175, Block 1, BBB&C Survey.

Flowing natural, through 15/64-in. choke, the well made 120 bbl. of 41° oil a day. Tubing pressure was 175 psi. and gas oil ratio was 144:1. Pay perforations were from 3,570-76 ft.

New work for Jones County included the following: E. R. Perkins 1 Gray, is a 3,700-ft. operation 1 mile north of Hamlin. Location is on a 340-acre lease in 175-1-BBB&C. Great Lakes Carbon Corp. 1-A Dickenson is a 5,000-ft. wildcat 14 miles southwest of Anson, on a 60-acre tract in William Harris Survey 217. So journer Drilling Co. 1 Bettis is a 3,600-ft. test 3 miles east of Stamford in TCRR Survey 1.

Coleman Test Is Gardner Sand Prospect

Bridwell Oil Co. 1-C Dunman, wildcat 5 miles north of Novice in Coleman County, recovered 1,700 ft. of oil and 95 ft. of heavily oil and gas-cut

What the Press says about the Tanker

"WORLD GLORY"

DESIGNED, BUILT, TURBINED BY BETHLEHEM

N. Y. HERALD TRIBUNE
APRIL 9, 1956

World Glory makes seventeen-knots loaded on 15,000 horsepower, using eighty-three tons of fuel daily.

"This unrivalled efficiency was an important factor in the decision to build the new ship for American flag operation. In the last two years, other tankers of 45,000 tons and more have been built abroad, but this is the first time that one of these mammoth ships will join the American merchant marine."

NEW YORK TIMES
APRIL 9, 1956

Three vessels are to be built in this country and will be registered here. In addition to the super tanker, orders have been placed for two more at 32,000 tons each.

The Niarchos tanker World Glory, slightly smaller than the present ship, was built at the same yard, but for foreign registry. The new vessel's design closely follows the World Glory's. The latter's extraordinary efficiency has attracted great attention. On 15,000 horsepower she develops seventeen knots, using only eighty-three tons of fuel a day.

N. Y. HERALD TRIBUNE
APRIL 17, 1956

The 46,000-ton tanker will be slightly larger than the World Glory built by the same Bethlehem yard for Mr. Niarchos who is operating it under the Liberian flag. The World Glory has established a remarkable record since she went into service two years ago for reliability and economy of operation.

NEW YORK TIMES
AUGUST 26, 1954

The World Glory is very fast afloat and smooth in operation. Her 15,000-horsepower turbines turned out speeds in excess of seventeen knots in all-out trial runs last May, and she managed to better sixteen knots while using only 12,000 horsepower.

Master Is a Veteran

The master of the World Glory, Captain Corcacas said she had handled "like a baby carriage" on her initial trip.

NEW YORK TIMES
MAY 4, 1954

After the vessel docked shortly after 2 P. M. at the Boston Naval Shipyard in East Boston, Captain Smith praised the performance of the tanker, the second largest merchant ship built in this country. The 53,000-gross-ton superliner, United States, built at Newport News, Va., is the largest.

"She performed marvelously," he said.

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Los Angeles Harbor — San Francisco Harbor

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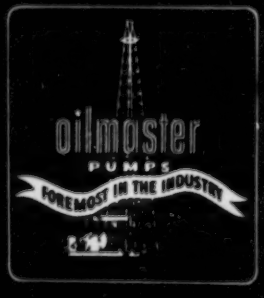

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mud on a drill-stem test from 3,547-54 ft. The tester was open 1½ hours, and had gas to the surface in 7 minutes. Shut-in pressure was 1,390 psi. in 30 minutes. Location is Section 100, Block 2, GH&H Survey.

Stonewall County . . . David M. Grubbs et al, 1 Laird-Hills, wildcat 5 miles northwest of Swenson, has completed as an Ellenburger discovery, making 186.6 bbl. of 42° oil in 24 hours through 14/64-in. choke.

Operators reported top of the Ellenburger at 6,435 ft., and top of pay at 6,441 ft. Final perforations were from 6,441-57 ft., and acidized with 2,000 gal. Tubing pressure was 340 psi. and gas-oil ratio was 670:1. Location is in Section 220, Block D, H&TC Survey.

SOUTH LOUISIANA

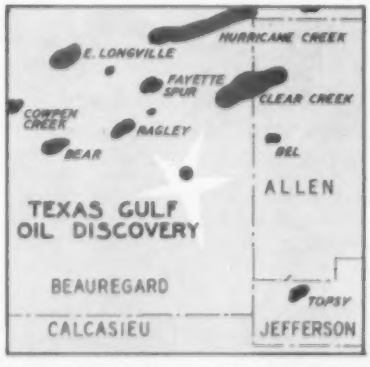
Oil Production Opens in Another Beauregard Area

Texas Gulf Producing Co. is opening another producing area in southeastern Beauregard Parish, along the Cockfield-Eocene-Wilcox trend.

Its discovery well, 2 Bayne, in 34-6s-8w, southeast of Ragley, flowed at the rate of 140 bbl. of oil per day in preliminary drill-stem testing of perforations at 9,448-53 ft. Flowing was through ¼-in. and ⅛-in. choke after unloading a 3,000-ft. water cushion. Flowing pressure 300 with gas-oil ratio of 751 cu. ft. per barrel.

Two deeper prospective pays, one perforated at 9,664-68 ft. and the other at 10,065-75 ft., previously had been tested getting small shows of oil and gas. Hole had been drilled and cased to 10,200 ft.

The discovery is 3 to 4 miles southeast of Ragley field, and about the same distance southwest of the large Clear Creek field.



LOCATION of Texas Gulf Producing Co.'s oil-discovery well in southeastern north Beauregard Parish (indicated by arrow).

Shallower Pay Produces in Mosquito Bay Extender

The second well for the Mosquito Bay area in the coastal marshes of Terrebonne Parish is being completed in a sand about 2,200 ft. shallower than of the discovery well.

It was drilled by Shell Oil Co. on a state lease in Four League Bay about ¾ mile southeast of Forest Oil Corp.'s discovery well, 1 Nelson, completed last December.

Shell's well, drilled to 12,500 ft., is productive from perforations at 7,949-57 ft. Tested through 5/32-in. choke, it flowed 3,000,000 cu. ft. of gas with 30 bbl. of 51°-gravity condensate per day. Its flowing pressure was 2,950 psi.

Forest's discovery-well was completed from pay at 10,266-72 ft. after drilling to 14,580 ft. It had a test-flow of 2,720,000 cu. ft. of gas with 114 bbl. of 55.5°-gravity condensate per day through ¼-in. choke with 3,100 psi.

LOUISIANA OFFSHORE

Production in Two Sands Confirms Offshore Field

Another sand, the second, has proved productive in Superior Oil Co.'s second

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well in its West Cameron Block 71 field, in the Gulf of Mexico, 15 miles off the coast of Cameron Parish, Louisiana.

Its discovery well, 1-A Bureau of Land Management, completed last May, was productive of gas and condensate from pay at 12,258-75 ft.

The second well, drilled to 13,171 ft., first tested a perforated interval at 13,098-13,108 ft., flowing 103.95 bbl. of condensate and 6,353,000 cu. ft. of gas per day through ⅛-in. choke.

Latest reported testing is of sand perforated at 12,553-63 ft., from which a flow of 50 bbl. of condensate with 6,636,000 cu. ft. of gas per day through 5/32-in. choke was recorded.

Superior is drilling near 15,000 ft. in its third well.

SOUTH TEXAS

TEXAS GULF COAST

Victoria County Wildcat Gets Two-Pay Production

A dual-pay gas and condensate well is opening another producing area in the northeast corner of Victoria. The discovery is by Morris and others at their 1 Vaughn, ¾ mile southeast of Fordtran, in T&NO Survey 11, A-484, completed from perforated intervals at 8,540-48 ft. and 8,656-64 ft. It is 17 miles north of Victoria.

From the upper zone, the well tested 10,000,000 cu. ft. of gas per day through ⅜-in. choke with pressure of 1,190 ft. The lower zone had a flow rate of 4,700 cu. ft. of gas per day through ⅜-in. choke with pressure of 1,025 psi. Fluid content was ungaged, but gas from both zones carried heavy sprays of condensate.

Hole had been drilled to 9,150 ft., but plugged back to 8,680 ft. in casing run to 8,712 ft. Rig now is on the operator's second location, 1 Nickel Gas Unit, 2,500 ft. west of the discovery.

The discovery is more than a mile south of East Fordtran field, production from Wilcox at 5,500 ft.

West Blue Lake Discovery Makes Small Oil Producer

The Texas Co. has a small oil producer at its 1 Minchen-Jackson Unit, a wildcat 7 miles west of Angleton, in Brazoria County. The well is being completed on the pump for 13 bbl. of 36.4°-gravity oil per day. Pay is perforated at 9,168-80 ft. with bottom of hole at 11,445 ft. Location is 1½ miles southwest of Blue Lake field. Tentative name for the area is West Blue Lake.

Second Walla-Boyt Well Is Dual Pay Oil Discovery

Wesley West has completed his second well and first oil producer in the 2-year-old Walla-Boyt field, in northeastern Chambers County. It is his 1 Stanolind, perforated at 8,277-81 ft. in the first Struma sand, and 8,987-91 ft. in the Text Miss sand. His discovery well, 1 Boyt, 1,600 ft. southwest, completed in August 1954 and the only well drilled in the immediate area until now, was a 20,000,000 gasser in a basal Frio sand at 8,750 ft.

The newly completed well flowed 106.55 bbl. of 35.5°-gravity oil per day through 3/32-in. choke from the upper zone, and 123.04 bbl. of 44.5°-gravity oil per day through 7/64-in. choke from the lower zone.

Wharton County Discovery Completed As Dry Gasser

Ada Oil Co.'s newly completed discovery well 1½ miles southwest of Kendleton, in eastern Wharton County, just west of the Fort Bend county line, is rated good for 35,000,000 cu. ft. of gas per day, open flow. During potential tests, it flowed 2,281,000 cu. ft. per day through 7/32-in. choke, 1,687,000 cu. ft. per day through 3/16-in. choke, and 1,207,000 cu. ft. per day through 5/32-in. choke. The well, 1 Duncan, was drilled to 5,076 ft. Productive zone is perforated at 4,924-34 ft. Gas is dry. Ada's southwest offset, 1 Jackson, has been drilled to 5,115 ft. without commercial showings.

SOUTHWEST TEXAS

Second Hockley Producer Follows Duval Discovery

Recent opening of Hockley production by C. C. Winn in the John Mew area off the northwest flank of the Fitzsimmons Pettus-sand field, in northeastern Duval County, is being followed by another discovery in the same formation by H. J. Porter in a wildcat more than a mile north.

Porter's discovery-well, 1-C Fitzsimmons, in a 15-minute drill-stem test at 3,564-68 ft., in Hockley sand, filled 1,300 ft. of pipeline oil, plus 10 ft. of oily mud. Test was through ¼-in. choke, registering bottom-hole pressures of 885 psi., flowing, and 1,365 psi., shut-in.

The well, after being deepened to 4,560 ft., has oil-string cemented for completion.

In the meantime, Winn is drilling on his second well, a location southwest of his discovery well. Also Richardson Oil Co. is starting a test 1,550 ft. southwest.

The area is 10 to 11 miles northwest of San Diego.

Potential Flow Gaged in Dimmit County Discovery

Michel T. Halbouty's newly completed Olmos-sand oil-discovery well in northwestern Dimmit County, flowed 91.42 bbl. of 36.4°-gravity oil per day through 7/32-in. choke during its final potential test. Flowing pressure was 150 psi.

Completion is from perforated interval at 2,922-26 ft. in the Olmos zone, in which the well had 30 net feet of sand. The well had been drilled to 4,633 ft. Casing was run to 3,114 ft.

Discovery-well, 1 Shook, located 7 miles southwest of Carrizo Springs, is 4 miles west of Wintergarden field, nearest production. It is on a 9,000-acre block. Drilling is under way at a 660-ft. north offset, 1-A Damon White.

Tentative name of the area is "Fay."

Deeper Oil Pay Opened In Piedre Lumbre Area

Harkins & Co. has a deeper-pay oil-discovery in the old Piedre Lumbre area, in northwestern Duval County. It is in its 1 DCRC, in Section 100, being completed from casing-perforated interval at 7,015-18 ft. in Yegua sand. Previous production in the area has been from the Cole, Government Wells, and Lomia Novia sands in the Jackson section.

During pre-potential tests, the Harkins well flowed at rates of 70 to 80 bbl. of 35.4°-gravity oil per day through chokes. Flowing pressure was 1,500 psi. Hole had been drilled to 7,192 ft.

Piedre Lumbre is about 4½ miles northwest of Freer, located in the heart of the widespread Government Wells field.

Deep Gas Well Expands Vinegarone Extension Area

Phillips Petroleum Co. is completing another well in the deep-sand Vinegarone gas-condensate area of northeastern Val Verde County, in far-southwestern Texas.

It is the company's 1-B Cauthorn, in the GC&SF Survey, A-508, which, in an 8-hour test through ½-in. choke, flowed at the rate of 14,000,000 cu. ft. of gas per day. Placed on a ⅜-in. choke, it flowed at the rate of 9,000,000 cu. ft. of gas per day for 8 hours. On 11/64-in. choke, flow was at the rate of 3,200,000 cu. ft. per day. No estimate of liquid recovery was reported.

Production is from the area's Penn-

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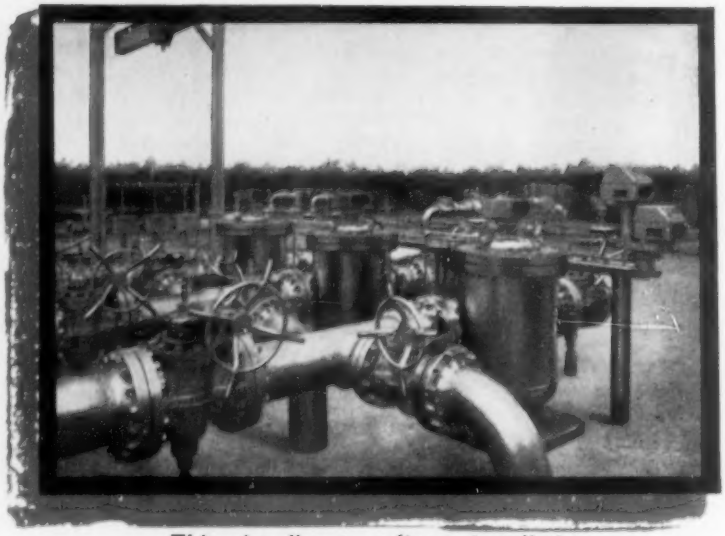

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sylvanian-Strawn sand, perforated at 10,070-10,150 ft. Location is 2,775 ft. northeast of the operator's 1 Cauthorn extension well.

SOUTHEASTERN STATES

MISSISSIPPI

Issaquena Wildcat Gets Lower Cretaceous Shows

Promising oil showings have been encountered in a Lower Cretaceous wildcat test being drilled in southeastern Issaquena County, at the upper west edge of the state.

Opening of commercial production in the Lower Cretaceous at this location would mark a long northwestern extension of this horizons development trend in the state. It is 30 to 35 miles northwest of Bolton, nearest Lower Cretaceous field.

The wildcat, being drilled by Amerada Petroleum Corp., Vaughey & Vaughey, and Reece, is one of a series of Lower Cretaceous exploratory tests being put on this group's extensive lease block in the southern part of Issaquena County. It is on their Delta Wildlife & Forestry, Inc., lease, in 5-9n-6w, just south of the Sharkey County line.

Latest reported showings were believed to have been in the Mooringsport zone, with indicated top at 5,858 ft. from elevation (derrick floor) of 100 ft. Top of Paluxy zone was marked at 4,872 ft.

With bottom of hole at 6,274 ft., a drill-stem test was run from 6,265 ft. Recovery, with tester open 30 minutes through ¼-in. chokes was 368 ft. of gas, and 53 ft. of 20.4°-gravity oil, in addition to the 540-ft. water cushion used. Bottom-hole pressures ranged from 612 to 1,225 psi., flowing, and 2,663 psi., shut-in. No salt water was indicated.

Deepening from the 6,274-ft. testing depth, no shows have been obtained.

ARK-LA-TEX

ARKANSAS

Winchester Strike Gaged in Union

The discovery well of new Winchester field, 1¾ miles southeast of New London, Union County, was gaged last week. Olin Oil & Gas Corp. 1-F Olin Fee, C NW SE 2-18s-12w, pumped and flowed 126 bbl. of 22°-gravity oil per day and 4 per cent basic sediment and water.

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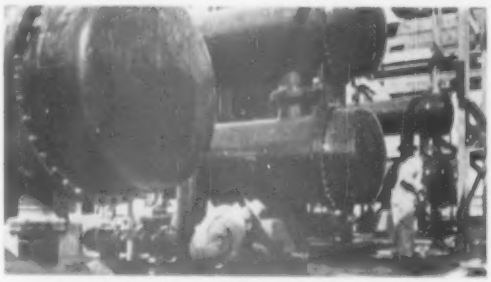

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Name_____ Title_____
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This well produces from the Meakin sand through perforations at 2,639-45 ft. Location is 1 mile northwest of Cotton Valley production at New London field.

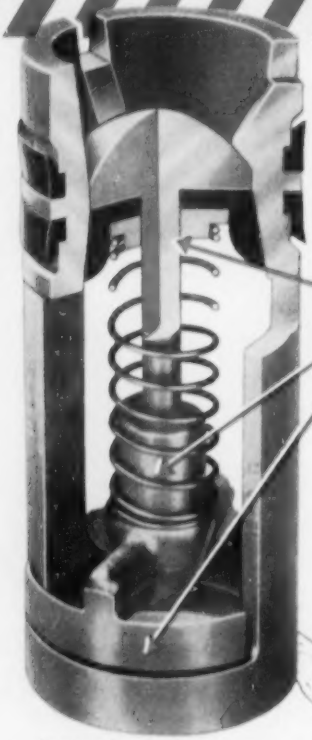
Rodessa Well Finaled In North Stamps Field

McAlester Fuel Co. completed a Rodessa oil discovery inside North Stamps field, Lafayette County. The A-1 Maude Petrey, NE SW 4-16s-23w, flowed 67 bbl. of oil and 100 M.c.f. of gas per day on 11/64-in. choke from perforations at 3,773-79 ft. The gas is from perforations at 3,039-40 ft. in the Mooringsport.

Gloyd Zone Discovery Flows at West Bradley

Arkla Oil Co., Inc. is testing at its 3 Hortense Stevens in C E½ SW NW 5-20s-26w, southeastern Miller County, with indicated Gloyd zone production. The well flowed 200 bbl. of oil per day on ¼-in. choke from perforations at 5,990-6,001 ft. Reports from the field state the Gloyd zone has 7 ft. of pay. The new-pay discovery is located on the west side of West Bradley field.

The "WINNER" by a landslide!



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EAST TEXAS

Extension Finished at West Slocum Field

West Slocum-Woodbine field gained a 1-mile west extension at Gibson Drilling Co. 1 Huddleston, W. R. Wilson Survey, A-66. Potential was 213 bbl. of 45° oil a day through 12/64-in. choke, under tubing pressure of 700 psi. Gas-oil ratio was 859:1. Operators drilled into the Woodbine pay at 5,416 ft., on elevation of 468 ft., and perforated from 5,534-40 ft.

In Cass County the Rodessa field was extended 1 mile west by F. R. Jackson 1 Cash, in Briant Holmes Survey 447, 4 miles north of McLeod.

No. 1 Cash flowed 124 bbl. of oil a day through 18/64-in. choke from Hill perforations at 5,932-46 ft. Gravity was 42°, gas-oil ratio 826:1 and tubing pressure 253 psi. The well was a dual completion. Top of Gloyd pay was 6,086 ft. and potential from that zone was 121 bbl. of 41° oil a day, with gas-oil ratio 126:1. Pressures and choke size were not reported. Total depth was 6,100 ft.

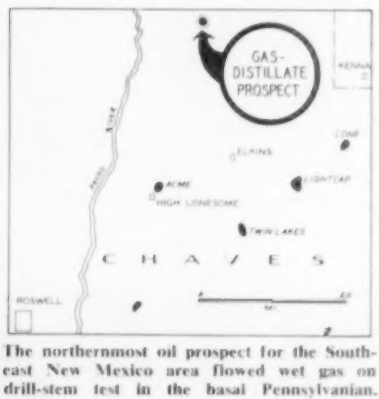
In Franklin County Tidewater Oil Co. 1-D Irene Alexander, in New Hope field 9 miles south of Mount Vernon, completed as a gas-distillate well. Potential was 313 bbl. of 61° oil, with 2,288 M.c.f. of gas, through 17/64-in. choke. Pay is the Smackover at 12,158-12,415 ft.

WEST TEXAS-NEW MEXICO

SOUTHEAST NEW MEXICO

Shallow Discovery Makes High Flowing Potential

General American Oil Co. of Texas has completed a Premier sand discovery about 24 miles northeast of Artesia,



The northernmost oil prospect for the Southeast New Mexico area flowed wet gas on drill-stem test in the basal Pennsylvanian. Wildcat is Charles Miller 1 State, in 20-4s-27e. Test was reported on last week, at 6,292-6,370 ft. Gas was at the rate of 4,000 M.c.f., plus heavy distillate yield. Drilling continued below 6,474 ft. in Mississippian chert.

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and 4 miles north of the Square Lake area.

The firm's 1 Federal-Sivley, in 8-16s-30e, gaged 527 bbl. of oil a day through various sized chokes, from perforations in the sand at 2,648-66 ft. Total depth was 2,960 ft. Tops reported were the Queen at 2,023 ft. and Grayberg at 2,439 ft.

Lea County Field Gets New Pay Zones

Humble Oil & Refining Co.'s south offset to the firm's Pennsylvanian (Cisco) discovery northwest of Tatum and east of Bagley, has added Wolfcamp and Devonian pay to the new field.

Earlier this year Humble 1 South Four Lakes Unit opened Cisco pay at 10,227-57 ft., flowing 304 bbl. of oil a day. The south offset, 2 South Four Lakes, 2-12s-34e, flowed 148 bbl. of oil in 3 hours on a test of the Wolfcamp between 9,870-9,920 ft.

In the Devonian, 2 South Four Lakes flowed gas and distillate at 12,439-12,600 ft. At 12,691-12,719 ft., the well flowed 146 bbl. of oil in 4 hours and at 12,718-44 ft. it flowed 21.6 bbl. in 2 hours.

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Operators continued testing, still in the Devonian. At 12,794-12,819 ft. the well flowed to pits for 54 minutes, then tanked 68 bbl. of 55.6° oil in 3 hours through 1 and 5/8-in. chokes. Flowing pressure was 1,310-1,225 psi. and gas-oil ratio was 5,159:1.

On the wells sixth flowing test of the Devonian, from 12,819-54 ft., using 5/8-in. chokes, it gaged 4,439 M.c.f. of gas a day, plus 76 bbl. of 55.6° oil in 2 hours. Gas-oil ratio was down slightly, at 4,878:1. Flowing pressure ranged from 1,685-2,000 psi., and shut-in pressure read 5,215 psi. Operators cored ahead below 12,878 ft.

Humble 3 South Four Lakes, a long east offset to the discovery, was drilling below 11,127 ft. in lime and shale, with no shows reported.

Third well at Lawton . . . Ralph Lowe 2 Lawton-State, 32-11s-38e, a 3/8-mile northeast extension and third producer for Lawton-Devonian field, was ready for completion. A flow test through 3/4-in. choke and perforations at 12,010-50 ft. gaged 124 bbl. of oil in 1 hour.

WEST TEXAS

Possibility of Simpson Pay at Puckett Stirs Interest

An extension well on the north side of Puckett field in southern Pecos County has created a stir of interest with its new pay possibilities.

The prospector is George S. Hammonds 1 Robbins, in SW SW Section 26, Block 126, T&StL Survey. Drillstem test at 10,875-11,010 ft. is thought to be either Simpson or Montoya. The test was open 3½ hours, using 2,000 ft. of water blanket. Gas surfaced in 27 minutes, at the rate of 1,083 M.c.f. per day, and water blanket in 45 minutes. After cleaning into pits for 43 minutes, it was turned into tanks, gaging 26 bbl. of oil an hour for 2 hours, through ½-in. choke. Oil was amber-colored and 52.6° gravity. Operators reversed out a full string of oil, with no water.

On elevation of 3,209 ft., the well had sample top on the Devonian at 10,168 ft. Gas pay in the Devonian was indicated from 10,178-10,334 ft. The prospective new pay section is believed to be a porous limestone entered at 10,700 ft. Location of the well is approximately 1 mile north of Gulf 1-A Robbins, Ellenburger gas producer.

Devonian discovery finaled . . . Charles H. Wacker 1 Breene has been completed as a flowing Devonian discovery. Location in 56-10-H&GN is 12 miles southwest of Imperial and about

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2 miles east of Heiner-Ellenburger field.

Operators reported the 1 Breene was flowing approximately 150 bbl. of oil a day after making successful drill-stem tests between 5,176-92 and 5,198-5,214 ft.

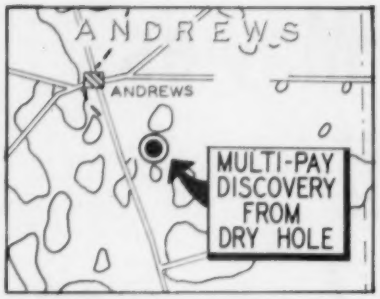
On the northeast side of Puckett field, Standard Oil Co. of Texas 1-I Robbins, 36-126-T&StL, flowed gas on a drill-stem test in the Devonian at 10,605-77 ft. Gas surfaced in 21 minutes, at the rate of 3,220 M.c.f. per day. The flow was through ⅜-in. choke. Flowing pressure ranged from 2,765-4,345 psi., when the flow line froze, and 90-minute shut in pressure reached 5,200 psi.

Andrews County Multipay Discovery Duals

W. E. Bakke 1 Grady, Andrews County wildcat that has found oil in nearly every formation drilled below its original total depth of 5,046 ft., dry, has been completed from both Ellenburger and Devonian pays.

Ellenburger potential was 341 bbl. of oil in 8 hours from perforations at 12,312-53 ft. Flow was through ½-in. choke, with gas-oil ratio of 484:1.

Devonian potential was 654 bbl. in 12 hours through ¼-in. choke, from perforations at 10,536-54 ft. Gas-oil ratio was 732:1.



Multipay discovery southeast of Andrews is W. E. Bakke and Choya Drilling Co. 1 Grady, which will be completed as a dual producer. A later potential on the Ellenburger rated the well at 1,022 bbl. daily. Flow tests were still being made in the Devonian.

Other indicated pays were the Clear Fork, Wichita-Albany, Wolfcamp and Pennsylvanian. Location is southeast of Andrews in 22-A44-PSL.

Winkler County . . . Stanolind Oil & Gas Co. prepared to run final tests on its 3-T-89 Hendrick, discovery or long extension to Ellenburger and Devonian production in the Kermit field northeast of Wink.

Tests on the Ellenburger through ½-in. choke, from perforations at 11,340-11,400 ft. gaged 15,000 M.c.f. of gas a day. Operators then tested the Devonian at 9,110-60 ft., making 18,000 M.c.f. of gas a day through ½-in. choke.

Another Midland County Gas-Distillate Prospect

Great Western Drilling Co. 1 Willis, wildcat 15 miles southeast of Midland in 33-38-T2N-T&P Survey, reported a small flow of gas and recovery of distillate on drill-stem test at 10,503-49 ft. Location is 2 miles southwest of Baxter 1 Heidelberg, gas-distillate Strawn discovery completed earlier this year.

No. 1 Willis flowed 225,000 cu. ft. of gas a day and recovered 450 ft. of heavily distillate and gas-cut mud, 540 ft. of gas-cut salt water and 10 ft. of 57° distillate. Shut-in pressure was 5,330 psi.

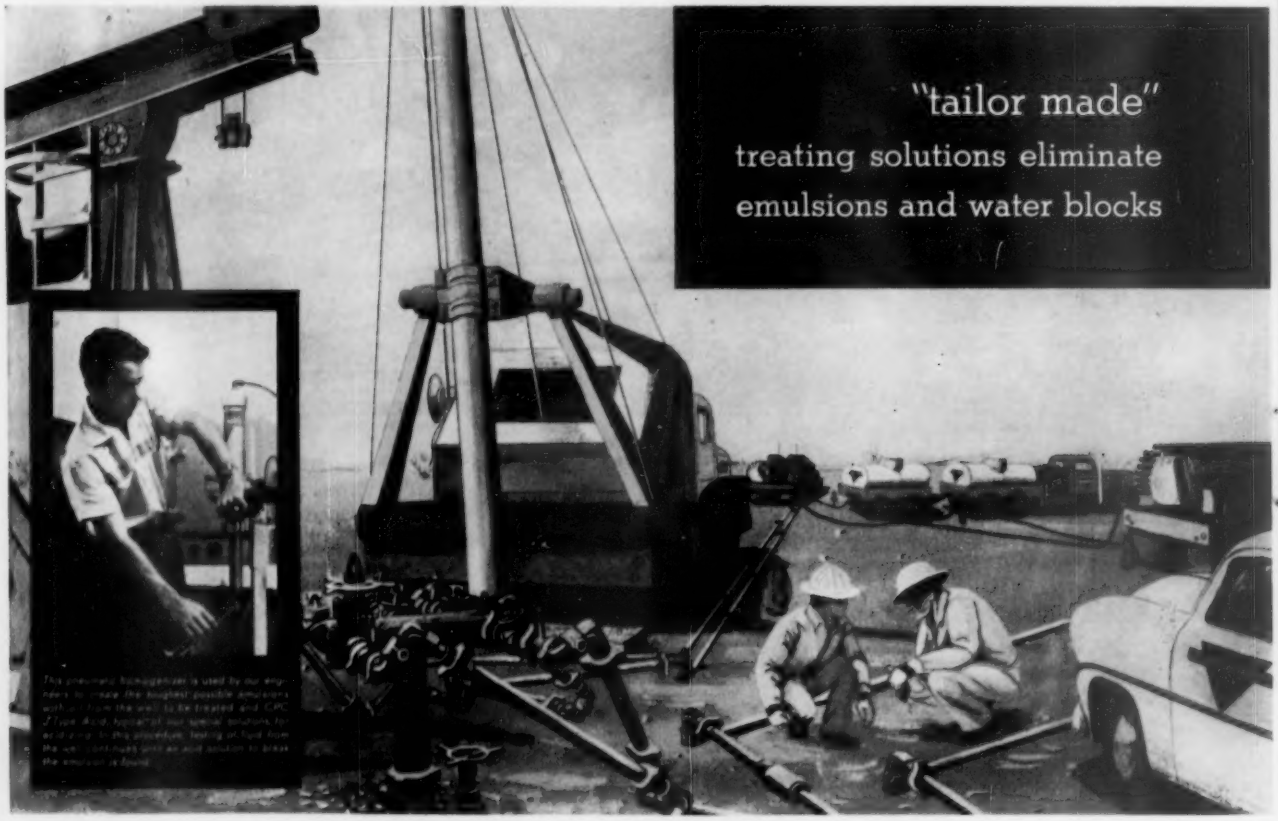
Successful Wildcats

KENTUCKY

Union County: Slagter 1 Hosback-Eckman, NW NE SW 7-O-19. IPP 75 BOPD, Cypress sand 2,326-31 ft. TD 2,336 ft. (Opens North Morganfield pool.)

TEXAS PANHANDLE

Roberts County: Phillips Petroleum Co. 1-A



Louke, SE NE 18-2-I&GN. IPF 660 BOPD, 6,230-45 ft. 4,302 M.c.f. of gas per day, 4,079-4,102 ft. TD 9,960 ft. (New pay discovery.)

OKLAHOMA

Beaver County: Cabot Carbon Corp. 1 Barby "E," SE NW SE 31-4n-28eCM. IP 32,415 M.c.f. of gas per day, Hoover sand 4,318-34 ft. TD 5,480 ft. (Gas discovery in Hugoton embayment.)

Love County: R. S. Gardenhire, Jr. 1 Hardy, SW NW NW 7-6s-2e. IPF 8 BOPD, 40° gravity, sand 540-64 ft. TD 600 ft. (Oil discovery.)

OHIO

Wayne County: Smith Petroleum Co. 1 C. G. Baker, Sec. 15, Franklin Township, Clinton 3,519-73 ft., IP 100 bbl. TD 3,578 ft.

East Ohio Gas Co. 1 O. M. Wertz, Sec. 33, Chippewa Township, Clinton 3,777-95 ft. IP 600 M.c.f. TD 3,840 ft.

PENNSYLVANIA

Indiana County, Young Township: Manufacturers Light & Heat Co. 4336 Stewart and R. & P. Coal Co., 10,900,000 cu. ft. gas, after fracture, Oriskany sand, TD 7,498 ft.

ALBERTA

Scurry Rainbow 1 Medicine Hat, LSD 3, 10-14-9w4. Indicated gas well. TD 3,219 ft.

Charter-Cal Standard 6-24 Youngstown, LSD 6, 24-31-10w4. Jefferson oil well. TD 4,860 ft.

Cities Service 16-21 Keystone, LSD 16, 21-48-4w5. Cardium oil discovery. TD 5,203 ft.

BRITISH COLUMBIA

White Lloyd 10 Blueberry, LSD 7, 9-90-25w6. Mississippian gas well. TD 7,142 ft.

WEST VIRGINIA

Randolph County, Dry Fork district: Hope Natural Gas Co. 9986 West Virginia Evergreen Co., elevation 3,023 ft., 2,037,000 cu. ft. gas after second fracture, chert 4,695 ft., Oriskany sand 4,847 ft., gas 5,017-21 ft. TD 5,150 ft.

CALIFORNIA

Glenn County: General Petroleum Corp. 1 Kennedy, SE NW 15-19n-2w, 9,400 M.c.f. daily, 74/64-in. choke, perfs. 5,685-96 ft. and 5,702-17 ft., TD 6,300 ft. (New gas pool discovery 1 mile west of Beehive Bend gas field.)

Glenn County: Humble Oil & Refining Co. 2 Mamie H. Porter et al, NE SW 13-18n-2w, 4,916 M.c.f. daily, ⅜-in. choke, perfs. 5,980-6,248 ft., TD 7,529 ft.

Ventura County: Standard Oil Co. of Calif. 1 E. J. Diedrich Community, NE NE 2-1n-22w, 467 BOPD, 27.8° gravity, perfs. 6,220-6,325 ft., TD 6,827 ft. (New pool discovery 1 mile west of Oxnard field production.)

Ventura County: Shell Oil Co., 1 Shell-Universal-Consolidated-Harvey, SE SW 12-3n-21w, 525 BOPD, 32.2° gravity, 20/64-in. choke, perfs. 7,068-7,532 ft. and 7,667-8,128 ft., TD 11,688 ft. (New Pliocene pool ¾ mile northeast of Bridge area production, South Mountain field.)

COLORADO

Logan County: British-American Oil Producing Co. 1-B Haley Smith, C NW NE 25-11n-54w. IPF 377 BOPD, "D" sand discovery, new field. TD 5,285 ft.

NEBRASKA

Banner County: Colorado-Century, et al, 1 Wilson, C NW SE 14-18n-56w. IPP 25 BOPD, "D" sand discovery, new field. TD 6,340 ft.

Kimball County: Braden Drilling Co. 1 Barth, C NW NE 15-16n-58w. IPP 230 BOPD, "J" sand discovery, new field. TD 7,208 ft. "J" sand.

WYOMING

Converse County: Carter Oil Co. 1 Government, C SW SE 34-34n-69w. IPF 49 BOPD, and 134 M.c.f. of gas per day, 21 BWPD, Mesaverde discovery, new field. TD 7,265 ft. Mesaverde.

Crook County: Glenwood Oil Co. 2 Barton Bros., SE NE SE 27-50n-65w. IPP 1½ BOPD, Dakota discovery. TD 87 ft.

SOUTH LOUISIANA

Acadia Parish: Kilroy Co. of Texas 1 Heinen, 14-8s-1e. IP 234 BCPD and 3,338 M.c.f. daily, 7/32-in., 58.9°, perforations 10,-929-39 ft. TD 11,424 ft. (New field in Northwest Branch area—2 miles from production.)

Avoyelles Parish: Gulf Coast Lease Holds 1 Campbell, 18-2s-3e. IP 144 BOPD, 5/32-in., 34.1°, perforations 7,144-54 ft. TD 8,765 ft. (Extends Dave Haas field 1 mile south.)

Cameron County: Sunray Mid-Continent Oil Co. 1 Cameron Parish School Board, 16-14s-7w. IP 120 BCPD and 2,000 M.c.f. daily, 5/32-in., 42°, perforations 11,449-48 ft. TD 13,010 ft. (New field.)

Vermilion Parish: Stanolind Oil & Gas Co. 2-A State Lease 862, Block 15, Vermilion area, Gulf of Mexico. IP 68 BCPD and 2,860 M.c.f. daily, 3/16-in., 50.2°, perforations 10,995-11,005 ft. TD 11,150 ft. (New pay in Vermilion Block 14 field.)

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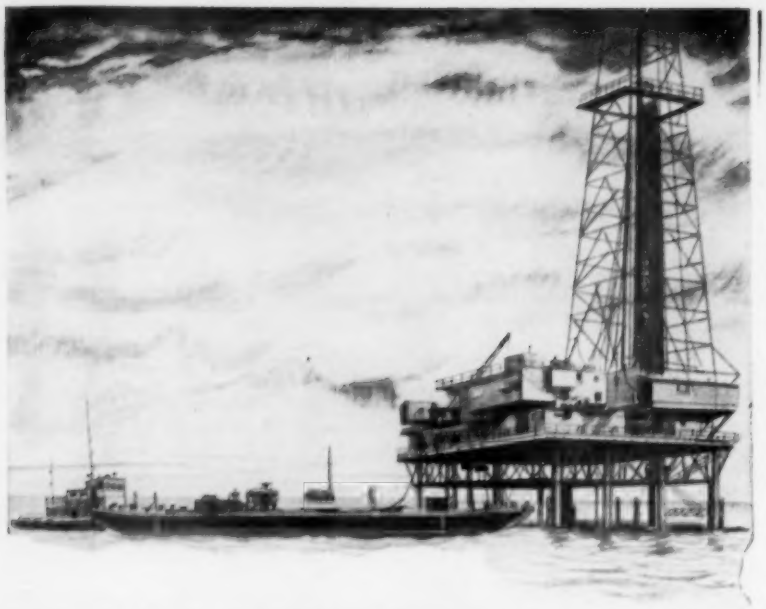

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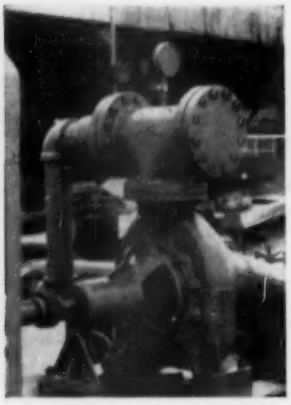

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TEXAS GULF COAST

Bee County: Hillcrest Oil Co. and Chiles Drilling Co. 1 Holzmark, S. May Sur. IP 16.82 BOPD, 9/29 choke, 48.4°, perforations 4,127-31 ft. (Yegua sand). TD 4,850 ft. (New pay and extension in Holzmark area—south of San Domingo field.)

Matagorda County: Texas Gulf Sulphur Co. 17 Texas Gulf, William Simpson Sur., A-89. IP 10,500 M.c.f. daily, open-flow potential, dry gas, perforations 4,385-95 ft. TD 4,550 ft. (Revives abandoned Big Hill-Gulf salt dome field.)

Wharton County: Amurex-Acco Oil & Gas Co. 1 M. S. Pryor, trustee, William Robinson Sur., A-55. IP 8,600 M.c.f. daily, open-flow potential, dry gas, perforations 4,885-87 ft. (Frio). TD 7,260 ft. (New reservoir and extension in New Taiton area.)

SOUTHWEST TEXAS

Duval County: C. C. Winn 1 John Mew Estate, J. Poitevent Sur. 287, A-416. IP 85.14 BOPD, 5/32-in., 26.4°, perforations 3,549-54 ft. (Hockley). TD 4,365 ft. (New field.)

Jim Wells County: Gus Tsemelis 1 Frank, La Vaca Grant. IP 6,600 M.c.f. daily, open-flow potential, GOR 198.1 M.c.f. per bbl., 64.7°, perforations 4,508-16 ft., and (dual completion) 1,470 M.c.f. daily, open-flow potential, dry gas, perforations 3,232-36 ft. TD 5,431 ft. (New field.)

Starr County: M. E. Andrews, Ltd., 1 Maresh, CCSD&RGNG Sur. 503, A-372, and Sur. 133, A-58. IP 74.07 BOPD, 3/32-in., perforations 3,580-90 ft. TD 3,913 ft. (New field discovery 2 miles west of Rincon production—West Rincon.)

WEST TEXAS

Andrews County: H. L. Brown 1 Charmichael 16-A45-PSL, 1 mi. N Andrews. IPP 124 BOPD, 31°, GOR 61, San Andres 4,682-97 ft. TD 4,762 ft.

Gaines County: Ashman & Hilliard et al 1 Medlin, 52-H-D&W, 12 mi. E Seminole. IPP 43 BOPD, 32°, GOR 368, San Andres 4,974-86, 4,992-5,006 ft. TD 13,223 ft., PB 5,048 ft., elev. 3,150 ft.

Stanolind Oil & Gas Co. 1-A Parmer County, Lab. 13, Lge. 317, Parmer CSL, 24 mi. NE Andrews. IPP 23 BOPD, 25°, GOR 1635, Queen 4,540-55 ft. TD 4,620 ft.

Winkler County: Skelly Oil Co. 111 Halley, 13-B11-PSL, 8 mi. SE Kermit. IP calculated open flow 3,090 M.c.f. gas, plus 85 bbl. 69° condensate, pay perforated 11,814-36, 11,826-36, TD 12,819 ft., elev. 2,786 ft.

NORTH TEXAS

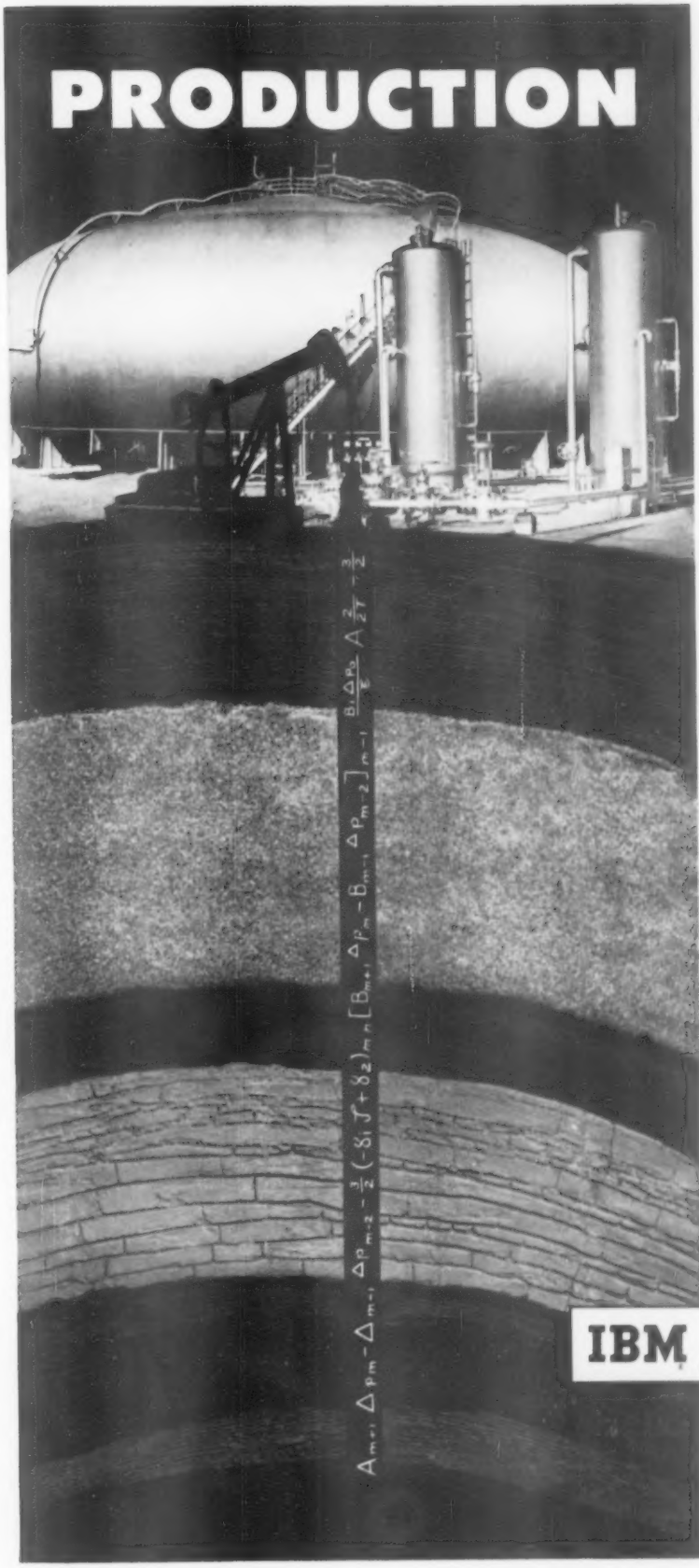
Jack County: W. H. Hammon 1 Strickland, Blk. 227, J. J. Gholson Sur., A-229, 3 mi. NE Gibton. IP 16,000 M.c.f. gas, plus 26.7 bbl. condensate per day. Shut-in pressure 1,200 psi., conglomerate 4,208-17 ft. TD 4,246 ft.

Jefson Oil Co. 1 Seth Box, Sec. 2787, TE&L Sur., 4 mi. NW Jermyn. IPP 101 BOPD, 40°, GOR 260, perforated 3,282-89 ft. TD 3,450 ft.

Montague County: Eureka Oil Co. 3 Lerner, Blk. 45, Wm. Ainsworth Sur., A-1, 3 mi. W Nocona, new pay discovery in Lerner field. IP 182 BOPD, 12/64-in., 42°, GOR 850, TP 425 psi., 4th conglomerate 5,268-78 ft. TD 5,375 ft.

WEST CENTRAL TEXAS

Throckmorton County: Tennessee Gas Transmission Co. 2 Beulah Liles, Sec. 292, BBB&C Sur., 3 mi. SE Throckmorton. IP 65 BOPD, 12/64-in., 48°, TP 100 psi., conglomerate 4,772-84 ft. TD 4,929 ft.



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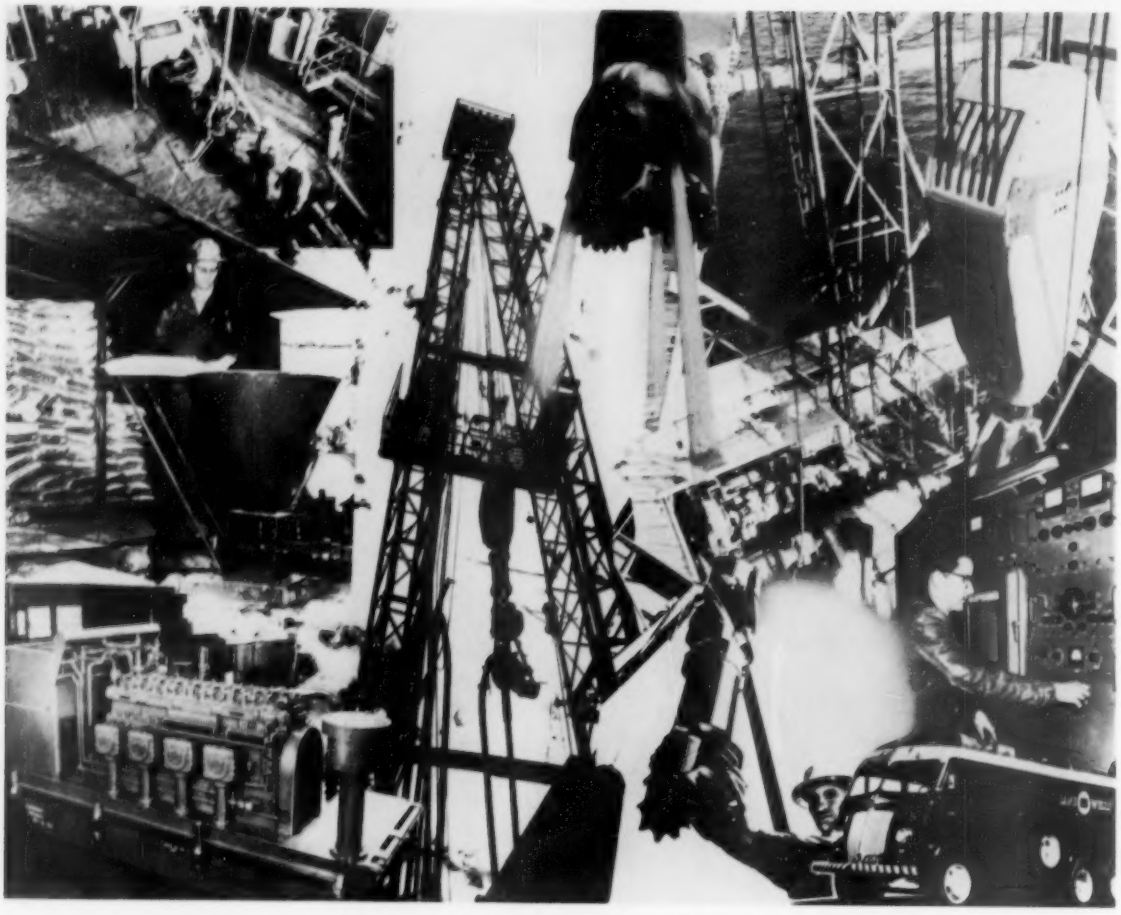

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Young man old in experience . . .

. . . Foley New Texaco Top Hand

A NEW president took over in the New York executive offices of The Texas Co. this week. He is James W. Foley, a young man old in oil-country experience.

Foley's elevation to the Texaco presidency capped 24 years' service with the company. But it makes an interesting story of how one man packed in enough different experiences to qualify for a top executive's chair in a short time.

Foley really got around, and touched nearly all the bases.

He has seen service in the Gulf Coast, Mid-Continent, Rockies, and California oil fields as well as valuable duty abroad. As a result Foley is probably better known in many district offices of Texaco than in New York where he rose rapidly to the top in just 7 years.

No big shot . . . There's still an oil-country flavor about Foley. He's no "tycoon" in the usual sense of the word.

He maintains an unassuming and personable approach to people. He has an engineer's directness coupled with a frank and open manner which should stand him in good stead in his new post.

Foley is a native of San Augustine, Tex., and was graduated from Texas A. & M. College in 1932, a depression year not considered too auspicious for fledgling petroleum engineers.

Foley managed to get a job—as a roughneck and roustabout — for Texaco. The place was Southwest Texas—and a good place and time to start.

Active developments at that time centered in Duval County. And young Foley was lucky to get in on some of the early work being done in gas lift and gas-oil ratio studies, just then becoming important. In his new capacity as a petroleum engineer, he also got his share of trips to Austin in the days when proration was being born.

Goes west and east . . . Events, however, moved quickly.

In 1935, Foley was transferred to the Rocky Mountain region. He was exposed to cable-tool drilling at Cut Bank, and the next year moved into California operations. He got two nice breaks in 1937. He married Gretchen Stewart of Green River, Wyo., and also got his first foreign assignment—again at the right time and place.

Texaco had just acquired a half interest in Bahrain Petroleum Co., Ltd., and Foley was one of the first company engineers to be sent to the Middle East. His original assignment was drilling, but this shifted to reservoir engineering when World War II broke out.

Foley admits there were a number of advantages for a young engineer at Bahrain in those days. He gained an entirely new slant on the oil business from working with veterans seasoned in foreign operations.

The problem of making do in an area remote from usual services and supplies was even compounded by war shortages. It sharpened his appreciation for resourcefulness—all of which will prove invaluable to him now as head of a world-wide oil operation.

A break . . . Foley frankly says one of his best breaks was the attention Bahrain and other newly acquired Middle East operations received from Texaco officials in the late 1930's.

He feels his share in this attention made him much better known in New York circles. This was an advantage when lists of prospective candidates for promotion were scanned in later years.

But that alone doesn't explain Foley's rise. A good insight can be found in a decision he made in 1940 upon transfer back to the States. He had a choice of a field or a division-office assignment. He went into the field as an engineer at Iberia, La., at a time when offshore operations were just starting.

At this point, Foley decided his long-range chances for advancement in the company also depended on his getting some supervisory experience. So he asked for a foreman's assignment. He got a little better job than he asked for—a district tool pusher's spot. That inevitably led to promotion as field superintendent.

A butane ruboff . . . So what happened? Foley found himself in the middle of field processing—a new field and new experience.

Texaco's giant new Erath plant was nearing completion when Foley became field superintendent. Luckily, he says, he was working with a lot of engineers who knew all about butanes and propanes. Some of it rubbed off on him. Evidently quite a lot rubbed off, because Foley's next job was division superintendent of all gas, gasoline, and cycling plants.

From that point, Foley's progress in Texaco quickened. He went to Houston as assistant to the manager of the producing department in 1947 and shortly after moved to Tulsa as assistant manager. Two years later he was called to New York as assistant to the vice president in charge of domestic production. The following year found him assistant to the board chairman and on February 1, 1953, he became a vice president.

Foley was elected a director in 1954 and executive vice president in 1955.

A family man . . . Foley doesn't have much time for too many outside activities. He is a member of A.I.M.E., A.P.I., and the Military Petroleum Advisory Board.

He takes his relaxation at home in Scarsdale with his family, which includes two daughters.

He shoots a little golf now and then for recreation. Foley confesses his score proves it's just for recreation, too.

B. W. VINSON

Bailie W. Vinson, president of Exploration Drilling Co., Tulsa, has been named chairman of the board. **B. E. Groenewold,** vice president and general manager, succeeds Vinson as president. Vinson also is chairman of Vinson Supply Co. Groenewold has been with the company for 8 years. He was with Cities Service Oil Co., National Supply Co., and Bethlehem Supply Co. before joining Exploration Drilling Co.

William J. Owen, president of Utah Drilling Co., has formed Triton Oil Co. in Denver. Owen will be president-geologist for the new exploration firm.

Personals

D. D. Anderson has been named district geologist at Phillips Petroleum Co.'s new Abilene, Tex., district offices.

Henry Rose, petroleum engineer for Cabot Carbon Co. at Pampa, Tex., has resigned to become an independent there.

Warwick M. Downing, chairman of the Colorado Oil and Gas Conservation Commission, has been reappointed to the commission by Gov. Ed C. Johnson. Under the new appointment, Downing will serve until 1961.

R. B. Anderson, president of Ventures, Ltd., and **Ben C. Belt,** retired Gulf Oil Corp. exploration vice presi-

BEN C. BELT

R. B. ANDERSON

dent in Houston, will receive 1957 outstanding industry service awards this week at the Texas Mid-Continent Oil & Gas Association's annual meeting in Houston. Belt, recently named chairman of the Texas Research League, will be cited for his public service activities which have continued past his retirement. Anderson, past president of the association, former Secretary of the Navy, and Deputy Secretary of Defense, was general manager of the W. T. Waggoner estate, Vernon, Tex., before joining Ventures in 1955.

T. S. Zajac, gas manager in Calgary for Shell Oil Co., has been appointed chief mechanical engineer in the company's Denver area production department. He replaces **T. S. Mitchel,** who has been transferred to Houston.

A. H. Weyland, vice president and production manager of Arkansas Fuel Oil Corp., has been elected president of the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association. Weyland succeeds **L. Lee Welch** of Lake Charles, La. Regional vice presidents of the association are **John J. Fromer, W. C. Fullilove, Jr., W. B. Berwald, A. H. Traver,** and **C. H. Lyons, Jr.,** North Louisiana; and **C. R. Cole, R. G. Lawton, C. H. Murphy, Jr.,** and **L. L. Baxter,** Arkansas.

Tulsa A.A.O.D.C. Chapter Elects

Earl Kirberger, second from left, Service Drilling Co., has been elected chairman of the Tulsa chapter of the American Association of Oilwell Drilling Contractors. He succeeds T. W. Wheeler, Loffland Brothers Co. New chapter officers are, left to right, Sam Brown, Helmerich & Payne, Inc., vice chairman; Kirberger; Jim Frawley, Frank Frawley Drilling Co., secretary; and Loyd F. Worley, Worley & Harrell, Inc., treasurer.

H. B. Wofford, Jr., senior petroleum engineer with Gulf Oil Corp. at Fort Worth, has been promoted to zone reservoir engineer and transferred to Roswell, N. M.

R. M. Twitchell, process engineer with Phillips Petroleum Co. at Okmulgee, Okla., has joined the Iraqi Government Oil Refinery Administration in Baghdad as process engineer.

Kelley C. Groseclose, initial operating engineer with Universal Oil Products Co., has joined Tidewater Oil Co. as operating area supervisor in Delaware City, Del.

A. H. Weyland has been elected vice president of Arkansas Fuel Oil Corp. in addition to his position as production manager. Weyland joined the company earlier this year after his retirement as chairman of the board of Arkansas Louisiana Gas Co.

Richard Anderson, assistant divisional superintendent of Sun Oil Co., has been elected general manager of the 1957 oil show in Lafayette, La., by the directors of the Louisiana Gulf Coast Oil Exposition.

W. J. Travers, vice president of Richfield Oil Corp., has been named head of Richfield's new combined exploration and production departments. The new department will have three divisions. **W. K. Krieger** will head the field operations division. **Mason Hill,** formerly chief geologist, will head the exploration division, and **F. E. McPhillips** will manage the land and lease division.

W. F. Brinker, district geologist for Hancock Oil Co. at Billings, Mont., has resigned to open consulting offices in Billings.

Dave Matthews, geologist for Brazos Oil & Gas Co., has joined Dow Chemical Co. in Midland, Mich., as geologist in the basic and nuclear research department.

Charles Sternberg, consulting geologist in Denver, has joined the technical assistant administration of the United Nations and will go to Israel soon as adviser on petroleum exploration.

J. F. DALEY

John F. Daley, general manager of the organic chemicals department of E. I. du Pont de Nemours & Co., has been promoted to vice president, director, and member of the company's executive committee. As head of the organic chemicals department, Daley was responsible for sales of petroleum chemicals and for the manufacture and sale of tetraethyl lead. **Samuel G. Baker,** formerly general manager of the photoproducts department, will succeed Daley as manager of organic chemicals.

R. W. Biggart, formerly geologist with Lon B. Turk at Oklahoma City, has been named president of Geo-Log Structures, Inc., a new company located in Tulsa. Other officers are **Robert A. Crane, Jr.,** vice president, and **William H. Hart,** secretary. Both are geologists.

J. SWEARINGEN

John E. Swearingen, vice president in charge of production for Standard Oil Co. (Ind.), and **Dr. Robert C. Gunness,** general manager of supply and transportation for the company, have been elected executive vice presidents. **Dr. Max G. Paulus,** vice president in charge of manufacturing since 1933 and a director since 1932, has retired.

S. MONTGOMERY

R. C. GUNNESS

Samuel A. Montgomery, general manager of manufacturing and a director of the company, will succeed Paulus as vice president. **Jesse C. Ducommun,** assistant general manager of manufacturing, will succeed Montgomery as general manager of manufacturing and will take Dr. Paulus' place as a director. Two additional vice presidents elected by the company are **Thomas E. Sunderland,** general counsel, and **Joseph K. Roberts,** general manager of research and development. **George V. Myers,** general manager of production, has been named a director succeeding the late Bentley G. McCloud.

William M. Martin, formerly executive vice president of Russell Cobb, Jr., Inc., and **Chet H. Jameson, Jr.,** formerly a partner in the firm of Manhart, Millison & Beebe, have formed the Martin-Jameson Oil Co. in Tulsa. The company plans exploration in Kansas, Oklahoma, Colorado, and Texas.

Bryson M. Filbert, chemical products coordinator for Humble Oil & Refining Co. in Houston, has joined International Petroleum Co., Ltd., as manufacturing adviser in Coral Gables, Fla. Filbert has been with Humble since his graduation from Pennsylvanian State University in 1936.

Tidewater Oil Co. has appointed four supervisors at its new Delaware Flying A refinery at Delaware City, Del. They include **Eugene Andrechak,** supervisor of economic planning; **Russell J. Hawes,** supervisor of refinery technology; **Vincent J. Tkac,** supervisor of control laboratories, and **Adam J. Transou,** supervisor of inspection.

John B. (Jack) Campbell, district engineer with Carter Oil Co. in Seminole, Okla., has been promoted to staff engineer and transferred to Oklahoma City.

G. C. Stillwagon has been promoted by Ada Oil Co. from district landman to manager of the West Texas-New Mexico district at Midland, Tex., replacing **Fred L. Stead,** who resigned recently.

P. C. Spencer, president of Sinclair Oil Corp., has been elected a director of Texas Pacific Coal & Oil Co., Fort Worth. Sinclair recently purchased about 30 per cent interest in Texas Pacific.

William C. Walker has been appointed manager of the contract department for Loffland Brothers Co. in Tulsa. Walker was with Phillips Petroleum Co. before joining Loffland Brothers in 1952.

Cecil V. Hagen, chairman of the board of directors of Gulf Coast Leaseholds, Inc., has also assumed duties as president of the company. He succeeds **Robert G. Behrman,** who has resigned. **William P. Swearingen,** vice president in charge of drilling and production, has also resigned.

Carl W. Shupp, superintendent of distribution in Southern California Gas Co.'s central division, has been promoted to Southwest division manager. He succeeds **E. F. Hawkesworth,** who has been named manager of special services. **Georg M. Babbe,** staff engineer in the distribution department, will succeed Shupp as central division distribution superintendent.

Personals

George T. Naff, president of Texas Eastern Transmission Corp., has been elected vice chairman of the board.

GEORGE T. NAFF

O. S. CARPENTER

Orville S. Carpenter, vice president and comptroller of the company, has been named president and member of the board of directors. Carpenter has been with Texas Eastern since 1947, serving as vice president since 1950. The change, intended to strengthen top management organization, will give Naff general supervision of the company but time to devote to diversification of activity and an extensive financing program which Texas Eastern will undertake.

W. B. Glenn, assistant division superintendent for Transcontinental Gas Pipe Line Corp. in Baton Rouge, La., has been promoted to division superintendent and transferred to Linden, N. J.

Fred Reid has been appointed district geologist for Lion Oil Co., a division of Monsanto Chemical Co., and transferred from Midland, Tex., to Abilene, Tex. Reid replaces **Sam D. Ayres,** who has resigned to open consulting offices in Abilene.

DEATHS

George Benedict Lamb, 60, geophysicist who headed Gulf Oil Corp.'s exploration operations in seven states and the Gulf of Mexico, died September 20 at his office in Houston. Lamb had been with Gulf since 1929.

Fred H. Crampton, 69, retired Michigan superintendent for McClanahan Oil Co. and its successor, Great Lakes Oil & Chemical Co., died September 15 at Shepherd, Mich., after a long illness.

Reese Poynter, 59, field superintendent for Carter Oil Co. in Montana's Cut Bank area, died recently of a heart attack. He had been active in the Montana oil industry for 33 years, the last 13 in the Cut Bank area.

R. C. McFarlane, 63, superintendent of the light oil and cracking division at Pure Oil Co.'s Smiths Bluff refinery, Nederland, Tex., died September 22 at Port Neches, Tex. McFarlane joined Pure in 1923.

Capt. Gaile E. Lindley, 55, president of California Transport Corp. and California Tanker Co., both subsidiaries of Standard Oil Co. of California, died September 24 in Summit, N. J., after a heart attack.

John Owens Harmon, 50, independent oil producer, was killed September 22 in an automobile collision near Carmi, Ill.

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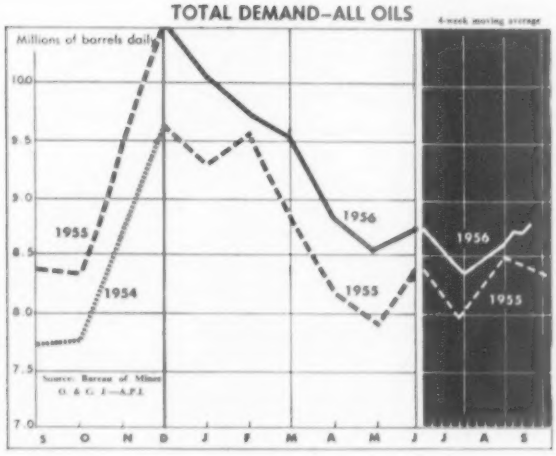
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,076,850	UP	9,950	UP	342,240
Crude stocks	275,253,000	UP	1,788,000	UP	19,790,000
Completions	1,075	DOWN	4	DOWN	82
Refinery runs	8,041,000	DOWN	37,000	UP	637,000
Gasoline stocks	176,944,000	UP	1,177,000	UP	25,139,000
Kerosine stocks	33,657,000	DOWN	55,000	DOWN	2,597,000
Distillate stocks	148,816,000	UP	2,711,000	UP	6,002,000
Residual stocks	47,835,000	DOWN	441,000	UP	903,000
Four-product stocks	407,252,000	UP	3,392,000	UP	29,447,000
Total imports	1,364,800	DOWN	128,700	UP	150,000



Seasonal Upturn of Heating-Oil Prices Starts on the Gulf Coast

CARGO prices for kerosine and distillate fuels increased on the Gulf Coast early in the last week of September. The low of kerosine quotations was up 0.375 cent a gallon to 9.5 cents. No. 2 distillate increased 0.25 cent to 8.75 cents a gallon.

These increases tend to offset reductions made earlier in the season. The current price on kerosine is the same as the quotation after the increase late in January this year. The market lost some of its strength by late in March and kerosine was moving at 9.25 cents. There was a revival in April under the influence of late demand for light heating oils and the price moved back up to 9.5 cents.

The reduction to 9.125 cents a gallon came late in July, and this price held until the latest increase.

Kerosine prices on the Gulf Coast and in some of the other marketing areas have been subnormal for almost 2 years. In past years, the normal spread between kerosine and No. 2 fuel on the Gulf Coast has been about 1.0 cent a gallon. Late in September 1954 the spread was cut to 0.5 cent. For short periods in 1955, this differential was reduced to 0.25 cent. At the first of this year, the low quotation for kerosine on the Gulf Coast was 9.0 cents compared with 8.75 cents for No. 2 fuel.

The latest quotations allow for a spread of 0.75 cent a gallon between the two products. This recovery of kerosine in most of the primary markets can be credited to the outlook for increases in consumption of jet fuel. Demand for jet fuel has moved up rapidly, and the trend is expected to continue with even sharper gains when the first jets are delivered to commercial airlines. Kerosine prices can be expected to move back to the normal differential over No. 2 fuel. The new kerosine price on the gulf is only 1.75 cents a gallon under the low of 11.25 cents a gallon for 92-octane regular gasoline.

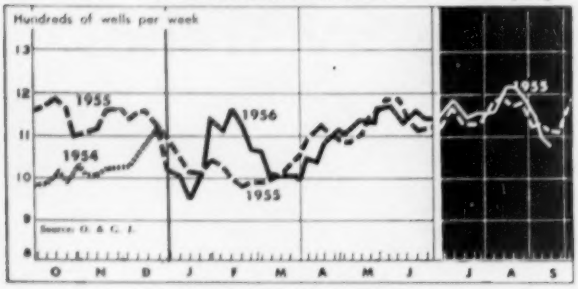
The outlook for increased demand for light fractions in the distillate range as components of jet fuel may raise prices on these products enough to discourage their use as cracking stock for gasoline. This in turn may lower the yield of gasoline and help prevent overproduction of this product.

Kerosine and distillate prices have not changed on the New York Harbor market since the increase early in January of this year. In many of the past years, summer-fill programs on the East Coast have included price reductions as well as price protection for summer purchases. There were no price reductions for consumers who filled their tanks this past summer. The current barge price in New York Harbor is 10.85 cents for kerosine and 10.35 cents for No. 2 fuel. The kerosine low quotation is up 0.55 cent and No. 2 fuel is up 0.80 cent over prices at this time last year.

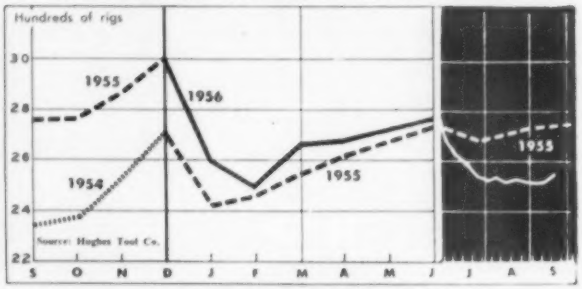
With kerosine and No. 2 fuel prices on the Gulf Coast back up to the quotations of last spring and these same fuels selling in New York at end-of-the-winter prices, any big jump in tanker rates will force higher prices on the East Coast.

The talk of higher tanker rates will boost early-season sales on the East Coast.

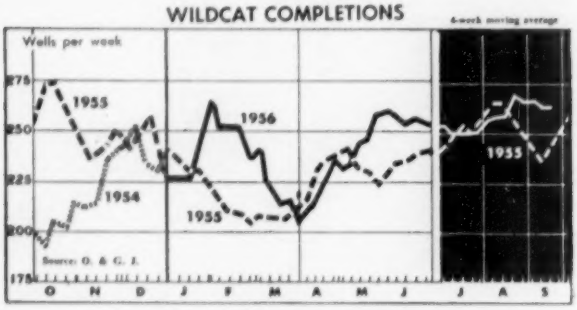
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	9-24-56	9-17-56	9-26-55
North Central and East	132	111	134
Southeast	38	41	33
Okla., Kans., Ark., Mo.	454	435	526
Louisiana	439	436	436
North and East Texas-Panhandle	375	368	398
Gulf and South Texas	243	245	257
West Texas-New Mexico	495	504	527
Rocky Mountain	269	263	318
Pacific Coast	114	110	130
Total United States	2,559	2,513	2,759
Western Canada	241	248	199

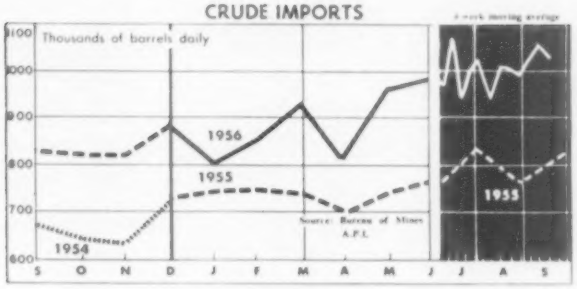
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 22, 1956

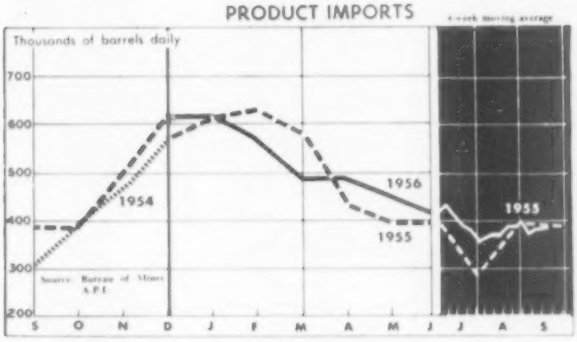
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	1	0	1	24,452	79	59	0	0	0	1	1	0	0	1	34	35
Arkansas	23	14	0	9	64,529	643	583	0	0	0	5	5	27	0	3	108	138
California	47	33	2	12	214,436	1,623	1,787	2	0	2	12	16	39	0	8	333	380
Colorado	35	4	3	28	196,063	859	1,078	1	0	0	23	24	19	0	11	425	455
Illinois	86	33	0	53	193,807	2,792	2,793	1	0	0	13	14	38	0	3	506	547
Indiana	18	6	0	*12	32,671	493	544	1	0	0	4	5	14	0	1	88	103
Kansas	70	32	3	†35	253,376	3,649	3,681	5	0	1	17	23	89	2	30	661	782
Kentucky	37	18	1	18	57,884	1,336	1,097	0	0	0	4	4	30	0	1	280	311
Louisiana	77	39	8	30	689,860	2,788	2,888	2	3	0	9	14	86	44	44	389	563
North	29	14	5	10	128,298	1,195	1,510	0	0	0	2	2	23	2	3	159	187
South	39	22	2	15	450,511	1,280	1,378	2	2	0	5	9	51	37	29	201	318
Offshore	9	3	1	5	111,051	313		0	1	0	2	3	12	5	12	29	58
Michigan	4	1	0	3	10,299	320	391	0	0	0	2	2	7	0	1	117	125
Mississippi	12	1	0	11	88,808	330	327	0	0	0	9	9	13	1	1	145	160
Montana	11	8	1	2	59,730	328	257	0	0	0	2	2	10	0	1	109	120
Nebraska	14	7	0	7	81,494	721	608	0	0	0	0	0	30	0	0	320	350
New Mexico	62	16	28	18	257,962	1,429	1,230	1	0	0	7	8	37	0	8	146	191
Northwest	38	2	28	8	146,278	613	406	1	0	0	1	2	8	0	7	49	64
Southeast	24	14	0	10	111,684	816	824	0	0	0	6	6	29	0	1	97	127
North Dakota	0	0	0	0	0	181	182	0	0	0	0	0	8	0	0	49	57
Ohio	18	13	2	3	51,264	768	845	1	0	1	0	2	2	0	2	5	9
Oklahoma	122	63	1	‡58	448,092	6,191	6,224	4	0	0	13	17	96	16	29	519	660
Pennsylvania-New York	2	0	2	0	10,519	764	1,148	0	0	1	0	1	0	0	9	11	20
Texas	380	210	14	156	1,645,176	16,267	14,722	16	0	4	91	111	558	28	138	3,402	4,126
Southwest (1 & 4)	35	13	3	19	122,727	2,328	2,264	2	0	1	15	18	103	6	46	637	792
Gulf Coast (2 & 3)	53	24	4	25	348,100	1,942	1,835	1	0	2	17	20	50	14	50	517	631
East (5 & 6)	12	7	1	4	66,597	841	710	0	0	0	4	4	12	2	5	283	302
N. Central (7-B & 9)	164	79	1	84	452,861	5,834	5,554	10	0	1	45	56	250	0	9	1,380	1,639
West (7-C & 8)	96	73	0	23	575,865	4,351	3,590	2	0	0	10	12	129	0	9	538	676
Panhandle (10)	20	14	5	1	79,026	971	769	1	0	0	0	1	14	6	19	47	86
Utah	6	2	2	2	36,175	95	70	0	0	1	2	3	3	0	4	49	56
West Virginia	19	1	16	2	55,655	491	466	0	0	1	0	1	0	0	8	8	16
Wyoming	30	12	1	17	129,189	616	620	0	0	0	14	14	12	0	8	157	177
Miscellaneous	0	0	0	0	0	70	42	0	0	0	0	0	4	0	0	58	62
Total U. S.	**1,075**	514	84	477	4,601,441	42,833	41,642	34	3	11	228	**276**	1,122	91	311	7,919	9,443
Total previous week	1,079	583	91	405	4,367,421			34	2	16	188	240	1,088	88	300	7,691	9,167
Total Sept. 24, 1955	1,157	596	74	487	4,656,593			38	1	9	234	282	1,198	150	265	7,285	8,898
Cumulative 1956	42,833	23,186	2,928	16,719	172,738,148												
Western Canada	73	61	2	10	321,281	2,252											

Service wells included: *1, †3, ‡7.

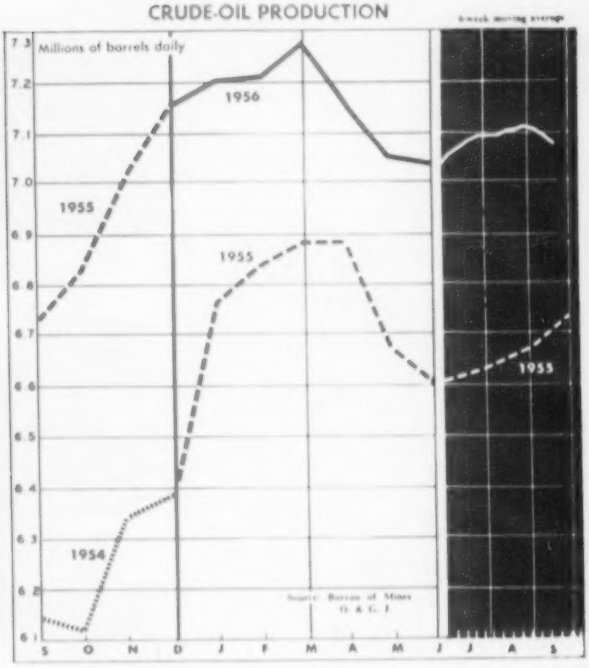
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

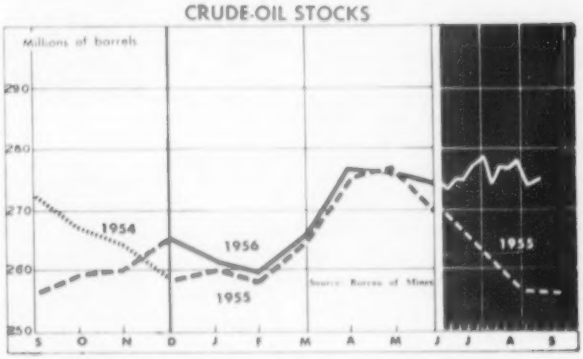


DAILY AVERAGE PRODUCTION FOR WEEK

	September 22, 1956			Sept. 15
	Crude oil	Lease condensate	Total	total
Alabama	9,150		9,150	9,200
Arkansas	79,550	400	79,950	80,000
California	958,600		958,600	959,200
Colorado	159,800		159,800	159,200
Eastern	50,900		50,900	51,600
Florida	1,325		1,325	1,325
Illinois	235,200		235,200	233,700
Indiana	31,000		31,000	30,900
Kansas	342,200		342,200	337,300
Kentucky	46,900		46,900	46,100
Louisiana	731,900	57,000	788,900	788,950
North	119,400	2,000	121,400	121,450
South	612,500	55,000	667,500	667,500
Michigan	28,000		28,000	28,800
Mississippi	108,800	4,625	113,425	113,425
Montana	63,100		63,100	62,800
Nebraska	37,200		37,200	39,100
Nevada	200		200	200
New Mexico	238,000	3,800	241,800	240,800
North Dakota	35,300		35,300	34,500
Oklahoma	†591,600		†591,600	†588,000
Texas	2,914,000	51,300	2,965,300	2,965,300
Dist. 1	56,000	450	56,450	56,450
Dist. 2	143,000	8,100	151,100	151,100
Dist. 3	419,000	24,200	443,200	443,200
Dist. 4	235,000	6,200	241,200	241,200
Dist. 5	42,500	400	42,900	42,900
Dist. 6	124,000	5,875	129,875	129,875
East Texas Field	202,000		202,000	202,000
Dist. 7-B	159,000	50	159,050	159,050
Dist. 7-C	180,000	3,750	183,750	183,750
Dist. 8	1,040,000	1,600	1,041,600	1,041,600
Dist. 9	213,000	475	213,475	213,475
Dist. 10	100,500	200	100,700	100,700
Utah	7,200		7,200	7,300
Wyoming	289,700		289,700	289,100
Others	†100		†100	100
Total U. S.	6,959,725	117,125	**7,076,850**	7,066,900
Change from pervious week, up			**9,950**	
Canada	†497,900		†497,900	†501,800
Total U. S. production Jan. 1-Sept. 22			1,900,053,700 bbl.	
Same period last year (crude plus condensate)			1,786,980,580 bbl.	

*Includes 29,737,250 bbl. condensate. †Week ended previous Monday. †S. Dakota.

CRUDE-OIL STOCKS



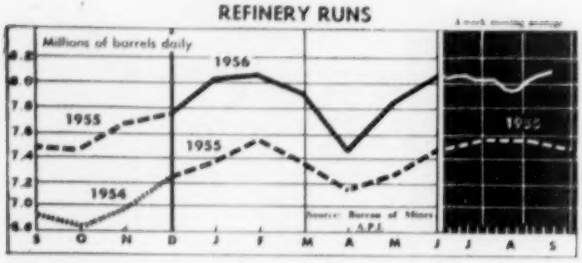
CRUDE STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

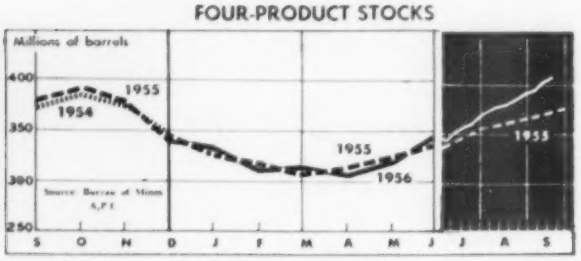
	9-15-56	9-8-56	9-17-55
Pennsylvania Grade	2,551	2,543	3,214
Other Appalachian	2,410	2,444	1,883
Illinois, Indiana, Michigan	11,359	11,000	10,014
Nebraska, North Dakota	2,364	2,455	2,096
Kansas	10,010	10,002	7,808
Oklahoma	26,773	26,603	21,486
Arkansas	2,924	2,840	2,673
Louisiana	17,164	17,661	16,016
North	2,497	2,594	2,725
South	14,667	15,067	13,291
Mississippi	3,055	2,957	3,063
New Mexico	8,278	8,239	7,558
Texas	121,805	120,920	118,909
East Texas proper	8,822	8,964	9,022
West Texas	59,097	57,776	55,968
Texas Gulf	23,488	23,109	23,718
Other Texas	30,398	31,071	30,201
Wyoming	17,098	17,229	14,632
Other Rocky Mountain	6,476	6,326	4,637
California	27,384	27,775	28,723
Foreign	†15,602	14,471	12,751
Total	275,253	273,465	255,463

*Bureau of Mines. †Includes 4,674,000 bbl. in California.

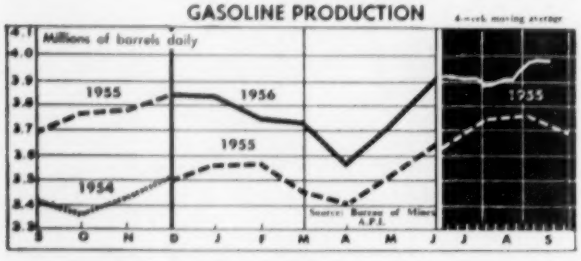
REFINERY RUNS



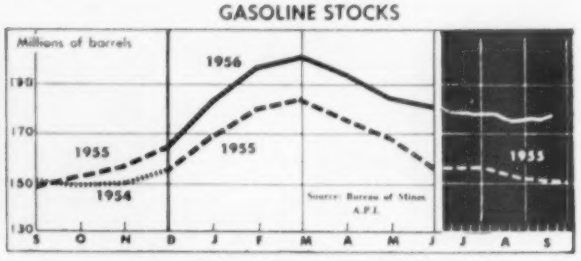
FOUR-PRODUCT STOCKS



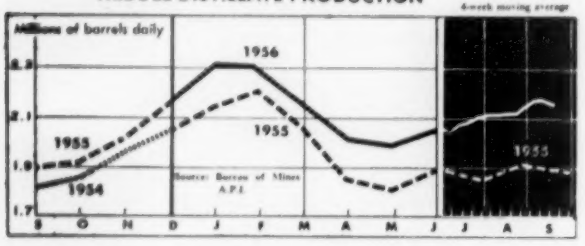
GASOLINE PRODUCTION



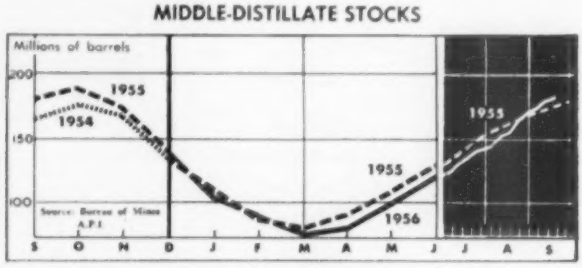
GASOLINE STOCKS



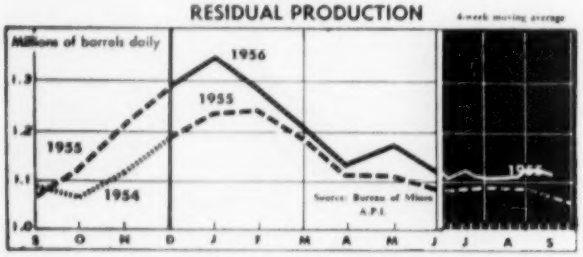
MIDDLE-DISTILLATE PRODUCTION



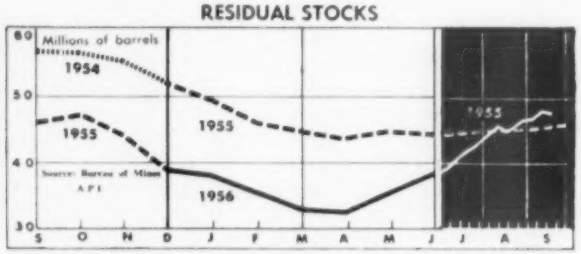
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, SEPTEMBER 21, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1955 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,131	490.0	9.7	321.4	174.1	43,158	12,812	54,493	12,739	1,085	463.7	31.5	257.9	191.0
Appalachian:														
District 1	107	50.6	5.0	25.7	4.4	4,587	574	3,370	544	94	40.1	3.8	21.6	7.3
District 2	90	55.3	1.6	17.6	11.4	3,071	765	1,041	487	97	54.7	1.6	14.3	11.0
Ind., Ill., Ky.	1,445	754.1	79.4	269.9	163.0	31,729	7,358	22,708	5,527	1,296	686.7	50.7	250.7	141.7
Minn., Wis., Dak.	96	47.1	4.1	27.3	6.6	6,312	1,618	7,900	189	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	661	374.6	12.3	154.7	27.9	14,988	2,116	13,411	1,410	703	421.5	21.6	167.2	29.4
Inland Texas	278	201.0	6.4	55.2	30.4	7,595	532	2,185	1,727	264	195.9	7.0	53.0	22.0
Texas Gulf Coast	1,947	943.6	126.7	452.7	257.9	23,955	3,616	17,564	6,715	1,781	845.0	94.6	444.3	218.2
La. Gulf Coast	730	351.7	71.9	196.2	54.7	10,074	2,542	7,282	1,686	662	337.3	53.7	161.8	44.3
N. La. and Ark.	104	40.0	7.6	24.1	5.6	4,545	832	2,914	237	88	33.9	7.4	21.9	5.6
Rocky Mountain:														
New Mexico	18	9.4	0.3	3.4	2.0	430	10	96	36	19	10.2	0.2	3.3	2.7
Other Rocky Mt.	284	131.9	7.4	57.4	35.7	5,202	496	3,386	876	258	119.9	2.5	56.8	36.2
West Coast	1,150	456.6	6.0	148.4	323.2	21,298	386	13,366	15,662	1,136	486.9	4.2	167.7	351.1
Sept. 21, 1956	8,041	3,905.9	338.4	1,754.0	1,096.9	176,944	33,657	148,816	47,835	7,483	3,695.8	278.8	1,620.5	1,060.5
Sept. 14, 1956	8,078	3,932.0	318.9	1,809.0	1,107.1	175,767	33,712	146,105	48,105					
Sept. 23, 1955	7,404	3,632.3	294.4	1,590.1	1,152.3	151,805	36,254	142,814	46,932					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.25-11.75
Premium (96 octane)	13.00-13.50
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California—Los Angeles (rack):	
Regular (84 octane)	12.1-12.6
Premium (93 octane)	13.35
Premium (96 octane)	14.3-14.6
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	5.0
Breckenridge:	
Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.5
★ Distillate No. 2	8.75
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
★ Distillate No. 2	8.75

WAX (I.B.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	$2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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★ Gulf-U.S.N.H., dirty (USMC+60%)	$4.56
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150,000', good, 2" line pipe.
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FOR SALE—At our Wichita gasolene plant three used 48" Dia. and three 18" Dia. 8-D grooved pulleys, 12" wide, 6½" bore with four ⅞" bolt holes for 41¼" flange hub. Removed from Wheatley Horiz. Triplex Pumps. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

41,000 FEET 4½" O.D. New Seamless Pipe weight 15.20 per foot 1035 steel High Pressure located Sherman, Texas. Price reasonable. Also good used seamless 5½", 7", 8", 10" casing and tubing, also good used line pipe various sizes. Lun-Dow Company, Box 1215, Tulsa, Phone LU 5-8850.

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Attn: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

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2 Worth LTC-6 800 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

MISCELLANEOUS

6—Adm. 785, 742, 425 sq. ft. ht. exch.
30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
800 ft. of 2" 4-6 ch pipe.
Large quantity of 410 SS chrome strips and sheets.
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One M-58 Bethlehem powered by 2 LRO Waukesha engines

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ELI DRILL M6D-160D on 1953 Ford F-750 Combination air and 4½ x 5 GD Pump. Excellent Condition, $10,000. ELI Drill M6T5-209 on 1952 2½ Ton Dodge. 6x6 Wheatley Pump. Excellent Condition, $7,500. Drills may be seen at 61st Street and Elwood, Tulsa, Oklahoma. SeisDrill, Inc., 515 Thompson Bldg., Tulsa, Oklahoma.

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FOR SALE—Unit 40 Drilling Rig complete with 133 ft. Lee C. Moore Mast, 2 LRO Waukeshas and C-250 National Pump. This rig is like new and is ready to go. For details write Box 469, Abilene, Texas.

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185 H.P. SUPERIOR, horizontal, twin direct-connected engine and compressor with 8x16x20 Ingersoll-Rand compressor cylinders, in running condition, including some spare parts. Location central Oklahoma. Dorset Company, 610 National Bank of Tulsa Building, LUther 4-7769, Tulsa, Okla.

CARDWELL MODEL "S", double drum with WAK Waukesha, 87 foot Moore mast, folding platform, substructure; Emsco 7½ x 14 pump with two WAK Waukesha; rotary, block, hook, kelly, swivel, BOP, light plants, tool house, bunk house, miscellaneous equipment. Box 3246, Corpus Christi, Texas.

U-15 DRAWWORKS, Ser. #458, with three NKU Waukesha engines and dual 15" Hydromatic Brake. Drawworks five years old. IVERSON SUPPLY COMPANY, Kermit, Texas. Phone 3491.

IMMEDIATE DELIVERY, Harvey, La. 1775' 5½", 21.90# Grade D, Rge. 2 internal upset, Reed Super Shrink Jts. 6—7¾" American drill collars, 1—9⅛" American single bowl overshot, 11—Subs for above. All new except collars made 800' surface hole. Simpson Drilling Co. Box 474, Olean, New York. Phone 2-0125.

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1 Model R, Two Drums, 96' Derrick
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All Units complete with dog houses, light plants, tools, lines and ready to work. Excellent Condition.

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LINE PIPE: 5000' 8" OD, 17 lb., 40' randoms. Clean, straight, beveled ready to lay. M. J. Regan Pipe Co., Coffeyville, Kans.

LARGE USED Twin Crank, Single reduction pumping unit, 72" stroke, mounted on long 12" x 12" H-beam steel frame, and 7,000 feet—¾" rods, extra long insert barrel, polish rod, stuffing box, complete outfit less engine, $5,750.00. Zephyr Oil Company, 1018 Peoples Bank Bldg., Tyler, Texas.

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WILL BUY FOR CASH—One complete Slim Hole Portable Drilling Rig, Diesel Power, capable of drilling slim hole to 8,000 ft. Prefer location Northern United States with equipment winterized. Box J-746, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

WANTED: Man with college education plus five to ten years experience with seismic records. Permanent location Houston with long established seismic contracting company. Salary open. Our employees advised of this ad. Write full particulars to Box J-734, The Oil and Gas Journal, Tulsa, Oklahoma.

OPERATIONS ENGINEER

Growing independent oil company wants petroleum engineer with three to six years of practical, technical, and administrative experience for position in operations planning and control section. Some knowledge of valuation work and oil and gas law would also be helpful. Reply should furnish details on education, experience, and references, and state age and required starting salary.

BOX J-794,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

ENGINEERS—Graduates or with equivalent experience in property surveys, route surveys, pipe line and pump station construction, and drafting. Send resume and salary requirements with application to Division Engineer, The Buckeye Pipe Line Company, P. O. Box 68, Emmaus, Penna.

RESERVOIR ENGINEER and GEOLOGIST

For Independent in Canadian Operations. Both to be located in Calgary, Alta., Canada. Reply:

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Investigate this opportunity. Write today, giving age, education and experience. Your inquiry will be kept strictly confidential and will be answered promptly.

Box J-739,
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SALES REPRESENTATIVE. Oil field drills and equipment. Must have broad knowledge of petroleum exploration and oil field drilling equipment. Oklahoma, Kansas, Arkansas and Texas Panhandle territory. Salary plus bonus and expenses. Write Box J-742, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN DOMESTIC EMPLOYMENT. List oil companies, drilling contractors, showing where apply foreign jobs $5.00 cash. List 100 large domestic oil companies $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

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Pilot with geological training and background to fly well equipped Beechcraft Bonanza, based in Houston, Texas. This is an excellent opportunity for a capable man with these combined talents. Starting salary commensurate with qualifications. Please give full details in letter of application.

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Petroleum Engineer with experience in appraisal and reservoir work wanted by permanently established independent oil company. Position requires practical as well as technical knowledge in the evaluation and financing of producing property purchases, and in administrative procedure. Must have the ability and initiative to develop necessary contacts in the active regions of the oil country. Reply should state age, education, experience, active references, and starting salary required.

BOX J-650,
THE OIL AND GAS JOURNAL,
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HELP WANTED

DIVISION GEOLOGIST—Independent Oil Company desires man under 40 with 10 years experience in Kansas and Oklahoma. Furnish resume of experience and education. Box J-719, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER and GEOLOGIST

For Independent In Mid-Continent Area. Both to be located in Oklahoma City. Reply:

BOX J-734,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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DRILLING ENGINEERS

Approximately one year minimum experience in or related to oil field for field engineering work. No Sales involved. Contact O. B. Norman by phone or letter.

Dresser Industries, Inc.

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All information confidential.
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HELP WANTED

NATURAL GAS ENGINEER with engineering degree plus experience in plant design or operation. Location Tulsa. Amerada Petroleum Corporation, Gas Department, P. O. Box 2040, Tulsa, Oklahoma.

SALES AND SERVICE ENGINEER, Illinois-Indiana Territory. Emulsion Treaters—Special Water Flood Equipment—Well Testers—Automatic Battery Installations. Applicant must have sales record and know area, also production experience. Box J-750, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEER. For California Oil Fields. Must have wide experience in selling, servicing, engineering and supervision of the installation of equipment for the treating, dehydrating, separating and handling of petroleum production. Chemical or petroleum production engineer preferred. Offshore production equipment experience helpful. Give complete details in first letter and salary requirements. Box J-709, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

HYDRAULIC CASING pulling unit operators and helpers. Call GLadstone 3-6551, Great Bend, Kansas.

RIG MECHANICS
DRILLERS

FOR FOREIGN EMPLOYMENT

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Attention of SHROGJ

Sahara Petroleum Co.

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WANTED
Experienced Refinery Personnel For Baghdad, Iraq

For work in a modern, complete refinery operation

Three year extendable contract with provisions for:

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Pipefitter Foreman
Yard and Cleanout (Rigger) Foreman
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Shop Foreman
Pump and Engine Foreman
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Chief Chemist and Coordinator
LPGas Engineer, Production and Distribution
Assistant Chief Accountant for Lube Oil Operations
Lube Process Engineers
Engine Test Engineer and Assistant
Shift Foremen, Lube Operations
Shift Operators for Vacuum Distillation
Shift Operators for Propane Deasphalting, Asphalt Blowing
Shift Operators for Furfural Treating
Shift Operators for Propane Dewaxing
Shift Operators for Clay Percolation and Acid Treatment
Foreman, Compounding Blending, Filling
Foreman, Can and Drum Making
Foreman, Asphalt Blending and Filling
Boardman (Controlman) for Vacuum Distillation
Boardman (Controlman) for Propane Deasphalting, Asphalt Blowing
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Cable: LOPESE Telephone Gibson 7-3193

HELP WANTED

PRODUCTION ENGINEER—For responsible position with large Independent Company operating primarily in Kansas and Oklahoma. Five to ten years experience to qualify. State qualifications and give salary requirements. Box J-747, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST & PETROLEUM ENGINEER—Oil Company with substantial holdings in South Arkansas and Northern Louisiana is expanding their organization. Excellent opportunity for a young geologist and an engineer with a minimum of two years experience in the area. Applicants for both positions must be willing to relocate in Dallas. Submit complete resume of education, experience, references, and salary expected. All replies confidential. Reply Box J-748, The Oil and Gas Journal, Tulsa, Oklahoma.

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MAJOR CONSULTING ENGINEERING COMPANY
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For promotional and development sales in the Gulf Coast area with a leading manufacturer of oil well drilling and producing equipment. Products involved are derricks, substructures and related equipment for off shore operation. Splendid opportunity for advancement. Salary commensurate with experience. Replies should include resume of education and experience, as well as salary requirements. Replies will be held in confidence.

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All this is yours now if you have a B.S., 5 years estimating experience on refineries and petro-chemical plants, meet other requirements.

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Division of Henry J. Kaiser Company

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ENGINEERS
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Combine challenging, unlimited future job with ideal, smog-free living in San Francisco-Oakland Bay Area. Excellent salary, moving allowance, profit sharing plan and retirement, family plan hospitalization and life insurance. Must have B.S. or M.S. in chemical engineering, plus at least 10 years experience in process design with major oil company or refinery builder. Forward complete resume giving experience and salary requirement. Strictest confidence.

ALSO OPENINGS FOR REFINERY DESIGNERS AND ESTIMATORS

KAISER ENGINEERS

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SITUATIONS WANTED

MARINE ENGINEER-SURVEYOR presently employed on offshore drilling tender wants to join Major operator with possibilities for advancement. Hold chief engineer's license; Diesel & Steam. Experienced in operation of and carrying out repairs of all types of equipment. Box J-749, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 15 years with major oil company including positions of production superintendent and division engineer, desires engineering or staff work with aggressive organization. Box J-731, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—Graduate Geologist, Geophysicist, with 18 years experience throughout most major areas of United States, seeks responsible position with independent oil company operating in the Mid-Continent or Rocky Mountain regions. Box J-716, The Oil and Gas Journal, Tulsa, Oklahoma.

MATERIAL MAN: Twenty years diversified experience in material control, coordination, inventory, accounting, purchasing, liaison. Available September 15th. Box J-723, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN with extensive experience, legal background, will represent individual or group desiring to enter Gulf Coast area, handling drilling deals, farmouts or royalties. HARVEY SCHMIDT, Box 7091, New Orleans 19, Louisiana.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

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Phone 3-3141.
146 Allen Building, Midland, Texas
Phone 2-2962.

SITUATIONS WANTED

SUPERINTENDENT DESIRES CHANGE. Very good reasons for desiring to leave present position. Box J-728, The Oil and Gas Journal, Tulsa, Oklahoma.

MAN WITH 15 years production and drilling experience wants work with independent company. Preferably Southern Kansas. Box J-751, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM PRODUCTION ENGINEER, extensive experience, both domestic and South America, desires responsible position with expanding Venezuelan operation. Box J-732, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Masters degree, 29, 4½ years diversified experience, Oklahoma and Williston Basin. Presently Employed. Prefer association with Independent. Box J-737, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: B.S., 35, 5 years experience, Four Corners, West Texas, including seismic, administrative work. Desires to relocate. Excellent references. Box J-741, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE CHEMICAL ENGINEER: With refinery, natural gas, economics and transmission experience desires challenging position. Box J-744, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

OFFERING CHOICE ROYALTIES ahead of drilling, in major company blocks. You can make small investments. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

SACRIFICE SALE: Water flood equipment, new with 6 wells, tanks, pumps, lines, etc., and 800 acres lease all for $11,500. Near Chanute, Kansas. (Owner) P. O. Box 2, Chanute, Ph. 1215. 1st. come, 1st. served.

FOR SALE: One Section (640 acres) of petroleum and natural gas rights in a hot area of Alberta, Canada. This could be a money-maker. What offers? Reply Box J-740, The Oil and Gas Journal, Tulsa, Oklahoma.

CONTACT A. L. BOWLES, Box 947, Ada, Okla., for attractive drilling deal in Seminole Co., Okla., or will drill well selling ¼ to ½ interest.

LEASE FOR SALE, 729 acres along the northeast border Utah, south of Rangely Field, excellent oil and gas possibilities. Box J-735, The Oil and Gas Journal, Tulsa, Oklahoma.

North Chaves County, N. M.

Recommend to small or large buyers leases & royalty in Major Company blocks. Drilling or to drill. Developments indicate great potential possibilities. Data on request.

W. J. PETERMAN, GEOLOGIST
Exploration 1918-1956 Engineering
Portales, New Mexico

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

WANTED

CONTRACTOR WANTED to drill 4 wells near Canadian Border to 4,750 ft. First 3,500 soft shale. Cable tools making 125 ft. hole per day. Terrific gas seepages of 99½% Methane. Will give liberal interest in 10,000 acres as part of drill costs. Urgent. Box 22, Emmaus, Pa.

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OIL PRODUCING PROPERTIES
Box J-726,
The Oil and Gas Journal
Tulsa, Oklahoma.

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BUSINESS OPPORTUNITIES

ESTABLISHED INDEPENDENT oil firm desires acreage within known geological structures. Straight leases or drilling deals considered. Submit full information to Box J-752, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL CONTACTS, Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES 817—51st St., Brooklyn, N. Y.

$50,000.00 TO $100,000.00 WANTED: developing oil and gas field, producing best system known, patented, joint manager or royalty. STODDARD OIL, 1917 Stevens, Minneapolis 3, Minnesota.

SERVICES

ASPHALT AND Lubricating Oil Consultant—Refinery design and operations. Development Methods. Lubrication; Specialty Products. Asphalt Technology. Highway Engineering. E. J. Barth, 54 West Street, Northampton, Mass.

PRODUCTION FOR SALE

160 ACRE LEASE now producing 55 bbl. daily, 35 gravity, in Chautauqua County, Kansas—$30,000. Also 120 acre lease now producing 8 bbl. daily—$12,000. Clyde Endicott, Phone MEdford 4-7346, Peru, Kansas.

PRODUCTION WANTED

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building Tulsa, Oklahoma.

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N. VanMiddlesworth
Phone: 54 48 02

Johnson Joins Staff Of Cable Engineering

Joe L. Johnson, Jr., petroleum engineer, has joined the staff of Cable Engineering, Wichita Falls, Tex. He was previously with Phillips Petroleum Co. in Borger, Tex., where he was a production engineer and participated in designing the first automatic lease control in Texas with pipeline custody transfer.

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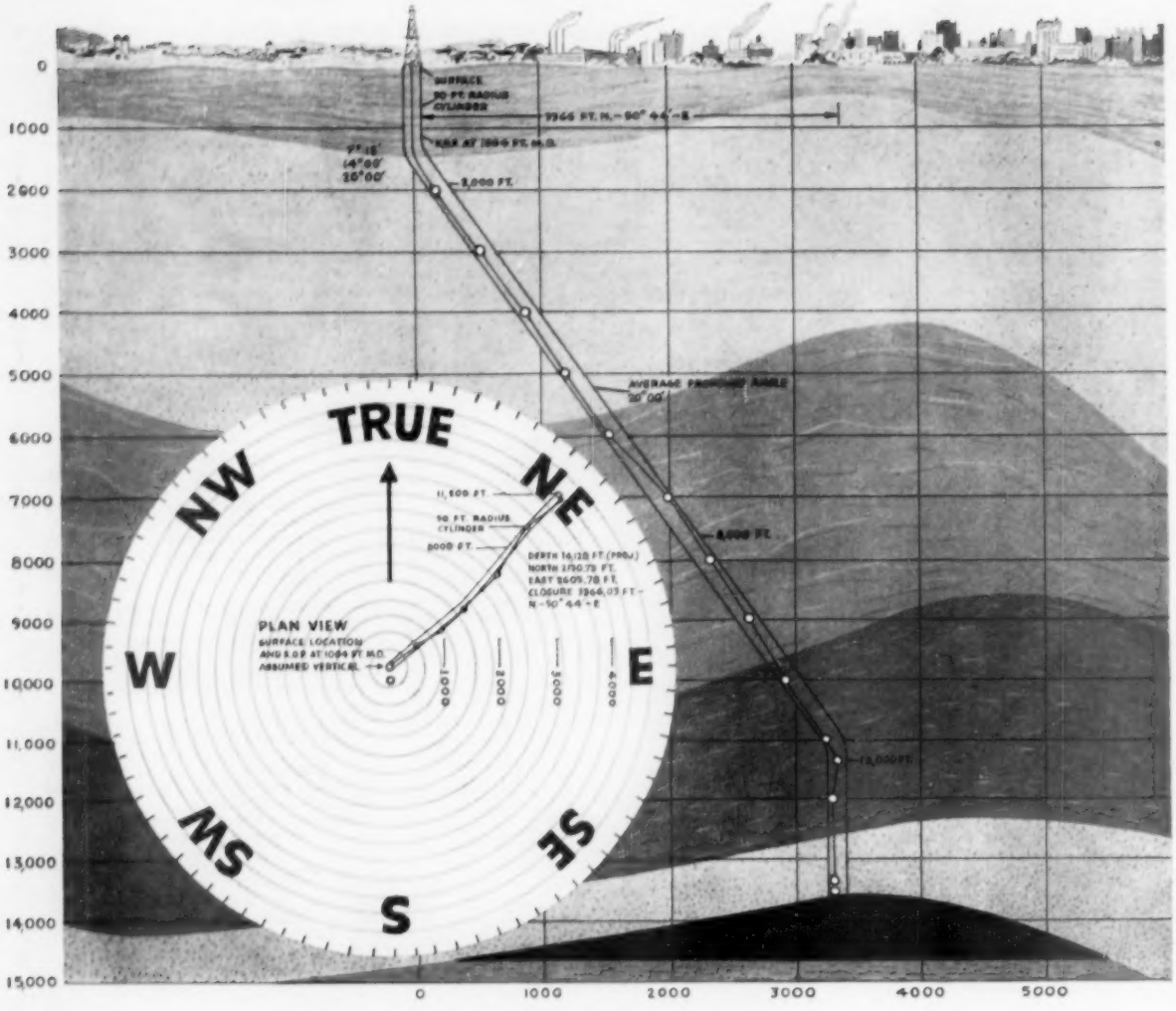
LEGAL

Sealed bids will be received until 1:00 P.M., Monday, October 15, 1956, and opened at that time at the Shawnee Area Field Office for the leasing of allotted Indian lands located in Cleveland, Pottawatomie, Lincoln, Payne, Oklahoma and Logan counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Robert D. Grover, Area Field Representative, Shawnee, Oklahoma. (Telephone 318).

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952, and Public Land Order No. 1298 of May 4, 1956, notice is hereby given that 538.48 acres of land including parts of secs. 3 and 12 in the University Leagues Subdivision, Blocks, 1, 11, 15, and 16, in Grayson County, Texas, situated within the Perrin Air Force Base, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P. M., E.S.T., on October 31, 1956. Details of the lease offer, copies of the lease agreement with plat of lease area and special stipulations as to use and protection of the property and drilling requirements, and bid forms, may be obtained from the Oil and Gas Supervisors of the Geological Survey at 239 Federal Building, Tulsa, Oklahoma, and at 333 St. Charles Avenue, New Orleans 12, Louisiana; the Commander of the Perrin Air Force Base, Sherman, Texas; or the Washington office of the Bureau of Land Management, or the Land Office at Santa Fe, New Mexico. L. E. Hoffman, Minerals Staff Officer.



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